INFORMATION MANAGEMENT DURING CARE TRANSITIONS OF OLDER ADULTS RECEIVING SKILLED HOME HEALTHCARE SERVICES AFTER HOSPITAL DISCHARGE

by
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Abstract

Statement of the problem: Older adults requiring skilled home healthcare (SHHC) services (e.g., home nursing) after hospital discharge are among those at highest risk of experiencing suboptimal outcomes. Information management (IM) refers to the ability of skilled home healthcare providers (SHHCPs) to collect, organize, and communicate older adults' care plans to key stakeholders, yet little is known about IM during this transition. Human factors engineering (HFE), a systems science investigating factors affecting human performance, may be useful to understand older adult safety during hospital/SHHC transitions.

Objectives: The objectives of this dissertation were to 1) develop a framework to guide research to improve the hospital/SHHC transition; and 2) use an HFE approach to identify critical IM action steps, system-level risk factors, process failures, and outcomes related to older adults' safety during hospital/SHHC transitions.

Methods: Data came from our five-site qualitative study associated with three SHHC agencies in rural and urban sites across the US. Data was comprised of over 180 hours of observation (60 home visits lasting ~3 hours each) and ~80 hours of interviews of older adults (n=60), informal caregivers (n=40), SHHCPs (n=46), and SHHC administrators (n=33).

Results: We identified eight IM action steps and five IM-related process failures during the hospital/SHHC transition. We identified three characteristics of IM during hospital/SHHC transitions: overlap among roles, tasks, information sources, and information targets; propagation of IM-related process failures over time; and variation in

IM across study sites. We identified 278 risk factors for process failures and 34 outcomes resulting from these failures. We also identified three key strategies SHHCPs used to obtain information when facing IM-related process failures: using the older adult/informal caregiver as a messenger; using alternative methods or additional sources to access information; and drawing on special relationships or connections with others.

Conclusions: Findings from these studies suggest that infrastructure is not in place to support IM during the hospital/SHHC transition. Efforts to improve IM must target a broad range of risk factors within health systems and SHHC agencies. Findings have implications for the design of tools and technologies to ensure situation awareness and support IM during care transitions.

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Preface

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List of Terms and Abbreviations

Care Transitions Measure (CTM): A 3- or 15-item questionnaire either administered over the phone or by mail to those recently discharged from the hospital asking about their experience with the quality of care delivered during the transition.

Hospital/SHHC transition: A period of 7-10 days after hospital discharge during which a person begins receiving skilled home healthcare (SHHC) services in the home.

Human factors engineering (HFE): A discipline within the field of safety science that combines qualitative and quantitative research methods to understand risks in complex systems, addressing factors in the system that affect human performance.

Informal caregiver: Any non-paid individual that participates regularly in the care of the older adult, e.g., family, friends, neighbors. This is in contrast to formal caregivers, who are paid to provide care to an individual.

Information Chaos framework: A human factors engineering-informed approach that categorizes five information-related process failures (i.e., information problems that may contribute to errors) that comprise information chaos (confusion and disorganization). These five process failures represent failures of the information management process: information overload, underload, scatter, conflict, and erroneous information.

Information management (IM): The process of collecting, organizing, and communicating older adults' care plans to key stakeholders (e.g., healthcare providers, older adults, caregivers) during the care transition.

Information management-related process failures: The five components that lead to information chaos (confusion and disorganization): information overload (too much information), information underload (too little information), information scatter (information in many places), information conflict (information not matching other information), and erroneous information (incorrect information).

Outcome and Assessment Information Set (OASIS): Federally mandated comprehensive assessment of all admissions to skilled home health care comprised of over 100 questions asked of patients during the initial skilled home healthcare visit.

Systems Engineering Initiative for Patient Safety (SEIPS): Conceptual framework used in the field of human factors engineering that expands upon the structure-process-outcome model used in health services research. SEIPS 2.0 describes a work system of six elements: 1) people; 2) the tasks people perform; 3) the tools and technology available and needed to complete tasks; 4) organizational factors shaping work; 5) factors related to the physical environment where work is performed; and 6) features of the external environment. These elements interact to constitute processes that produce outcomes.

Skilled home healthcare (SHHC): Services provided by healthcare professionals (e.g., nurses, rehabilitation therapists) under the Medicare Home Health Benefit.

Skilled home healthcare provider (SHHCP): Healthcare professionals (e.g., nurses, rehabilitation therapists, social workers, speech therapists) who provide skilled services, such as medication monitoring or wound care, on a short-term and intermittent basis (~ 2 visits/week, 60-day episode of care) to homebound patients.

Start-of-care (SOC) visit: The initial home visit performed by a skilled home healthcare provider approximately 48-72 hours after hospital discharge.

Chapter 1. Transitional care 2.0: Taking a broader approach to improving the care delivered to older adults receiving skilled home health care services after hospital discharge

Abstract

Errors during care transitions of older adults are common, costly, and sometimes lethal. A care transition is the movement of a person from one healthcare setting to another and is frequently associated with adverse outcomes. Interventions to improve care transitions are a high priority. However, the best practices by which to achieve such improvements are not clear, in part because intervention efforts are often disease- or setting-specific. For unclear reasons, those who require skilled home healthcare (SHHC) services (e.g., home nursing) after hospital discharge are among those at highest risk of experiencing suboptimal outcomes during care transitions, including early re-hospitalization. Though there are interventions focused on improving hospital to home transitions, these are not specific to SHHC settings, which are more complex. Human factors engineering is a systems science that evaluates the factors in a system that affect human performance.

The objectives of this paper are to: 1) discuss challenges during the hospital/SHHC transition that threaten older adults' safety; 2) describe how the science of human factors engineering can strengthen efforts to improve the hospital/SHHC transition; and 3) provide a framework for developing the next generation of research and interventions to improve the hospital/SHHC transition. We conclude this paper with the overall objectives of this dissertation.

Introduction

Burden of care transitions in older adults and current threats to older adult safety

Despite substantial investment in patient safety efforts over the last decade, most have focused on improving patient safety *within* care settings, with less focus on safety during transitions *across* different care settings. Transitions across settings represent a potential danger point, or critical time period, associated with adverse outcomes.[1-12] Older adults are especially at risk for safety problems during care transitions to and from the hospital. They are more vulnerable to the hazards of hospitalization (e.g., functional decline, delirium), [13,14] which result in greater needs after discharge. Once discharged, older adults transition frequently across healthcare settings,[15-17] are rehospitalized often,[18,19] and follow more complex therapeutic regimens compared to other populations.[20] These complex regimens require greater reliance on care delivered in the home, arguably the most common and poorly understood healthcare setting.[21]

Care transitions to the skilled home healthcare (SHHC) setting are common and especially risky when compared to transitions to other healthcare settings. SHHC refers to services provided by healthcare professionals (e.g., nurses, rehabilitation therapists) under Medicare.[22] These professionals provide skilled services, such as medication monitoring or wound care, on a short-term and intermittent basis (~ 2 visits/week, 60-day episode of care) to homebound patients. The SHHC visit rate was 3,276 per 1,000 Medicare beneficiaries in 2013.[23] Almost 5 million Americans received SHHC services in 2013.[24] In a national study of older adults,[17] the greatest number of problems (e.g., potentially avoidable hospital stays) occurred after hospital/SHHC transitions, as compared to other types of transitions (Figure 1). The SHHC patient population has

substantial health needs and experiences frequent care transitions.[25] The re-hospitalization rate for those receiving SHHC services is approximately 25%, with most occurring within 2-4 weeks.[26,27] Others have identified risk factors for re-hospitalization in the population[28,29] and a significant prevalence of adverse events (13%).[30]

Objectives

The objectives of this paper are to: 1) discuss challenges during the hospital/SHHC transition that threaten older adults' safety; 2) describe how the science of human factors engineering can strengthen efforts to improve the hospital/SHHC transition; and 3) provide a framework for developing the next generation of research and interventions to improve the hospital/SHHC transition.

Challenges in the SHHC setting that increase complexity and threaten older adult safety

The SHHC setting is unique among post-acute care settings. First, SHHC is delivered in a residential environment, with medical professionals intermittently present, and health-related responsibilities shared with informal caregivers (family or friends).[31] Second, though care transitions generally involve communication between people within the same discipline, transitions from hospital to home care ("hospital/SHHC transitions") also involve transfer of responsibility to laypersons.[21] Thus, patient outcomes are also dependent on the care provided by informal caregivers.[30] Laypersons may not be adequately trained to implement the care plan at the time of hospital discharge. The care transition is a vulnerable period for older adults and their caregivers, as they may be overwhelmed with information and not have the adequate support systems to process this information.[32-34] Third, older adults are transitioning under a time-pressured situation,

with incentives to execute hospital discharges in the mornings to enhance hospital patient throughput.[35,36] Thus, healthcare providers executing the transition may not have adequate notice of the older adults' discharge to prepare for the transition, and the older adult may have a rapidly changing clinical status affecting needs post-discharge. Finally, skilled home healthcare providers (SHHCPs) have difficulties obtaining the information they need to develop care plans, since medical team members are not easily accessible, and SHHCPs are often practicing "between medical record systems."[37-40]

Information management challenges and patient safety during hospital/SHHC transitions

Because of all the reasons that make SHHC unique as a healthcare setting, information management (IM) becomes a particularly important challenge during hospital/SHHC transitions. There are no standardized approaches in the literature for how to define or evaluate IM during care transitions; Descriptions of IM generally characterize how healthcare professionals track and transfer health information over time.[32,41-45] Literature on IM has discussed several elements as being important: communication among healthcare professionals and patients; transfer of key data elements (e.g., medical history, medication regimens, follow-up appointment times, contact information for key team members); and the role of information technology to both help and hinder IM.[32,38,43,46-50] We define IM as the ability of SHHCPs to collect, organize, and communicate older adults' care plans to key stakeholders (e.g., other SHHCP, medical providers, older adults, caregivers) during the care transition.

IM is a critical process to ensure transition safety, yet little is known about IM during hospital/SHHC transitions. Most studies of IM have one or more of the following limitations: data from only one stakeholder perspective (e.g. patient, nurse, doctor); data

from an individual healthcare setting (e.g., hospital unit); or data from one portion of the care transition (e.g., hospital discharge).[32,45,48,49,51-55] Few studies address more than one of these limitations, which is needed for a more comprehensive understanding of IM during hospital/SHHC transitions. Further, there is little understanding about *IM-related process failures,* defined as information problems that may contribute to errors[56] that occur when IM fails to achieve its intended outcome during transitions. This limited understanding hinders the development of interventions to improve hospital/SHHC transitions.

SHHC agencies are in need of strategies that incorporate real-time feedback to better ensure safe SHHC transitions

In response to the Affordable Care Act,[57] many healthcare systems, including SHHC agencies, implemented care transitions programs. SHHC agencies currently lack the ability to optimally track care transitions and to assess their quality.[25] Agencies perform a federally mandated comprehensive assessment of all admissions to SHHC using a measure called the Outcome and Assessment Information Set (OASIS).[58] SHHC agencies routinely submit OASIS data to the Centers for Medicare and Medicaid services for quality monitoring and payment purposes. However, the patient characteristics collected as part of OASIS are not predictive of rehospitalization,[25] in part because SHHCPs are not immediately aware of when and why patients are hospitalized.[28] Further, prediction models of re-hospitalization risk perform poorly and may need a broader set of variables that incorporate system-level factors.[59] These data substantiate the need for new, psychometrically sound, tools to enhance OASIS data and guide interventions to improve older adults' care transitions in real time.

Current measures of care transition quality are incomplete and do not provide real-time feedback. The Agency for Healthcare Research and Quality Care Coordination Measures Atlas[60] describes measures that incorporate some aspects of care transition quality. However, the majority of measures are not specific to understanding care transitions *per se*, and many focus on the ambulatory clinic setting. The metric most commonly used for the purpose of assessing the quality of care transitions is the Care Transitions Measure (CTM), an either 3- or 15-item questionnaire administered over the phone or by mail to those recently discharged from the hospital (from 48 hours – 6 weeks post discharge).[61,62] While the measure has been endorsed by the National Quality Forum, there are four important limitations in its use. First, we have found its use challenging in prior work.[63] Respondents found some of the questions difficult to understand, especially those with limited cognitive capacity. Second, the CTM-3 is not intended for administration to proxy respondents, and for older adults it is important to incorporate informal caregiver opinion into quality assessments of care transition quality. Third, the CTM-3 is only from the patient's perspective and does not measure the quality of care processes from SHHCPs' perspectives, which may be relevant to ensuring optimal care transitions. Fourth, others have questioned the CTM-3's ability to predict important outcomes.[64] Finally, the CTM-3 does not provide feedback as the transition is happening in real time, thus severely limiting the ability of healthcare providers to intervene in order to prevent clinical deterioration and adverse events.

Providing real-time feedback to healthcare providers is a critical step in improving patient safety and ensuring sustainability of improvement efforts.[65-68] Real-time feedback improves situation awareness of how an environment is changing, and

feedback is especially important when working in complex environments, such as airplanes and automobiles.[69] In healthcare settings, researchers have demonstrated the critical nature of real-time feedback in areas of service improvement, reduction of bloodstream infections, and operating room safety, among others.[66,70-73] Real-time feedback was the most important driver of error reduction during care transitions within a hospital in a recent study.[74] Indeed, to become "learning organizations" and ensure improved quality of care and patient safety, healthcare organizations must develop real-time feedback mechanisms.[75,76]

A consensus document by the National Transitions of Care Coalition,[77] outlines three perspectives from which information needs to be obtained in order to fully address optimal care coordination and transitions: (1) patient/family; (2) healthcare professional; and (3) healthcare system.[60] In this paper, we propose using a human factors engineering approach to understand information needs from these perspectives, an important first step in the development of tools for use during older adults' hospital/SHHC transitions. These tools would complement existing measures and incorporate these three perspectives, tools that to our knowledge do not yet exist.

Use of human factors engineering to reduce risks during hospital/SHHC transitions

Input from disciplines within safety science can strengthen care transitions improvement efforts. Health professional training does not typically include the acquisition of methods to evaluate the complexity of care transitions and the work settings in which they occur.[21] Current interventions to improve care transitions target specific patient populations (e.g., those with congestive heart failure), specific settings

(e.g., hospital unit, skilled nursing facility), or specific processes (e.g., medication reconciliation, discharge planning).[78-86] These interventions, while useful, do not employ a broader systems approach that includes examining healthcare provider and patient incentives shaping behavior and performance. Other approaches are needed to complement and enhance existing interventions.

Description of human factors engineering

Human factors engineering (HFE), which combines qualitative and quantitative research methods to proactively understand risks in complex systems, is an approach uniquely able to address safety issues in the SHHC setting. HFE is concerned with the design of work processes and systems, taking into account human capabilities. HFE evaluates individual work system components (tasks, tools, physical environment, organization, external environment) and their interactions with each other, with the goals of achieving optimum human safety and performance.[87,88] Researchers have used HFE approaches in other areas of healthcare to identify key areas for intervention to successfully transform practice, such as in critical care and operating room settings.[88-106] Many, including the Institute of Medicine, have called for applications of HFE to evaluate care coordination, improve care transitions, and develop tools customized for home-based health care.[107-111] Given its complexity, the SHHC setting lends itself well to using an HFE approach. Others have described significant issues related to human factors in the structure of SHHC agencies, (e.g., nursing shortages and limitations on reimbursement), and in the SHHC care delivery process (e.g., lack of ability to track patient's health and hospitalization history, limited time to provide complex patient care).[111] HFE has not yet been used to study the hospital/SHHC transition itself.

HFE spans across three domains: physical, cognitive, and macro ergonomics.[112] Physical ergonomics provides a framework for studying how physical limitations of SHHCPs, older adults, and caregivers interact with the physical space and design of the healthcare setting (work system) – e.g., determining how differences in the design of two physical environments (e.g., hospital and home) may lead to a fall after a transition. Cognitive ergonomics studies the interactions between cognitive capabilities and limitations – e.g., understanding how much information patients retain during the hospital discharge process and then redesigning processes to support retention. Macro ergonomics studies the overall work system in which care transitions are executed – e.g., determining how to optimize communication between two healthcare settings to improve safety. Table 1, adapted from our prior work,[109] provides examples of applications from each of these domains to the improvement of healthcare delivery in general, and to hospital/SHHC transitions in particular.

Systems Engineering Initiative for Patient Safety framework

The Systems Engineering Initiative for Patient Safety (SEIPS) 2.0[113] is a well-known model used in HFE research. SEIPS describes a structured work system of six elements: (1) *people* – e.g., SHHCPs, older adults, informal caregivers, physicians (2) the *tasks* people perform; (3) the *tools and technology* available and needed to complete the tasks; (4) *organizational* factors shaping the work, such as staffing, policies, teamwork, coordination, communication; (5) factors related to the *physical environment* where work is performed; and (6) features of the *external environment*, e.g., insurance regulations, cultural norms. These elements interact to constitute processes (e.g., medication or IM) that produce outcomes (e.g., medication adherence, improved health, job satisfaction).[113-

[115] Researchers have used the SEIPS framework to understand, evaluate, and improve a multitude of healthcare delivery processes in numerous settings.[116-130] SEIPS expands upon Donabedian's structure-process-outcome framework[131] by providing a detailed and expanded structure (i.e., work system), as well as a framework for modeling the interactions among components of the system.

Application of the SEIPS framework to hospital/SHHC transitions

Researchers can use the SEIPS framework to evaluate care transitions across different work systems.[98,99,114,132-135] We can consider three different work systems in relation to the hospital/SHHC transition: the hospital, the SHHC agency, and the older adult's home. Understanding the contextual factors within each work system is critical for guiding the design of interventions to optimize transitions. An intervention effective in the hospital may not be effective once the older adult returns to the home environment and no longer has the support of the healthcare professionals.[109] For example, it may be useful in the hospital setting to provide the older adult with education regarding how to take their medications or dress their wounds. However, several contextual factors may affect how the older adult performs these tasks once at home. For example, the older adult and caregiver (if present) may no longer recall the information, the education may not have covered critical information, or the older adult may be going to stay in an unfamiliar environment, such as a family member' home. We adapted the SEIPS 2.0 framework for use in our work (Appendix, Figure 13).

Incorporating ways to address contextual factors into intervention design can increase effectiveness and sustainability. Table 2, adapted from our prior work,[109] provides examples of potential contextual variables to consider within each SEIPS work

system element and examples of HFE-based approaches to evaluate contextual factors during the hospital/SHHC transition. Within the SEIPS framework, Table 2 depicts the following: 1) major components of several care transitions interventions; 2) aspects of the care transition targeted by each component; 3) contextual considerations that an HFE-driven approach would consider; and 4) examples of how HFE could enhance each component when applied to hospital/SHHC transitions.

Transitional care 2.0—A broader approach to improve hospital/SHHC transitions

Existing interventions have made important strides to improve care transitions. Despite these efforts, however, progress in improving hospital/SHHC transitions and reducing unplanned healthcare utilization has been stagnant. A broader approach is needed using innovative research and implementation methods, such as those informed by HFE. Table 3 compares and contrasts a "Transitional Care 1.0" approach—summarizing key components of existing interventions—with a "Transitional Care 2.0" approach—building upon Transitional Care 1.0 and incorporating key principles informed by HFE. We describe Transitional Care 2.0 in more detail in the subsections that follow.

Screening for both people and health systems in need of improved transitional care

Current approaches often screen for patient-level risk factors, such as the presence of specific high-intensity chronic conditions (e.g., congestive heart failure). "Hot-spotting," i.e., finding patients who are frequent utilizers of the healthcare system, is another screening method that has been in use recently. These screening strategies approach transitional care from a biomedical model, with a focus on treating dysfunction caused by biological aspects of specific diseases. We have described in earlier work the

limitations of improving transitional care using a biomedical approach that emphasizes the evaluation and management of specific disease states.[136] Most notably, the biomedical approach assumes the problem, and thus the solution, lies in altering something about the patient herself or himself. Transitional Care 2.0 interventions must instead include a view of the older adult as more than their disease state and must take into consideration the psychosocial and environmental determinants of health.

Additionally, research to develop Transitional Care 2.0 interventions must recognize the role health systems and SHHC agencies have in mitigating risk during transitions caused by dysfunction in organizational processes. Beyond system-level risk factors may lie regional characteristics and geographic variation affecting the use of healthcare services and the frequency of transitions. Indeed, the single biggest factor associated with readmission rates in an analysis of national Medicare data was not patient comorbidity, discharge planning quality, or supply-level factors.[137] Communities with the highest *admission* rates had the highest readmission rates, suggesting that communities differ in the way health care is organized and in the way they respond to patients with urgent complaints. The role regional factors play in shaping the incidence and prevalence of suboptimal care transitions requires further investigation.

Focusing interventions on a broad range of target processes

Many Transitional Care 1.0 interventions are hospital-based and focus disproportionately on improving the process of hospital discharge. In addition to targeting hospital-based processes, research to guide Transitional Care 2.0 interventions needs to target processes that affect a wide-variety of key stakeholders and go beyond simply ensuring transmission of the care plan to the next site of care. This broader

approach includes targeting the following additional processes: elicitation of patient preferences to develop the care plan; strategies for successful IM and communication across settings; and clarification of roles during the care transition. In turn, researchers need to include the perspective of each stakeholder (older adults, informal caregivers, SHHCPs, hospital-based and ambulatory care based medical providers) in the design of metrics.

Engaging care "receivers" by understanding needs across settings

Because of the focus on improving hospital discharges, Transitional Care 1.0 interventions address the needs of hospitals initiating the transition (the "senders"). "Receivers" are generally not engaged in improvement efforts, and senders often do not receive feedback on the quality of the care transition. Receivers include SHHC agencies, ambulatory care practices, assisted living facilities, and older adults and informal caregivers themselves. Indeed, every care transition is a cross-cultural exchange among people working in different "cultures" of the healthcare system (e.g., hospital culture, SHHC culture, family culture). Each of these cultures has a set or cultural norms creating incentives and guiding behavior. We have described elsewhere our recommendations to understand and meet the needs of receivers by performing a needs assessment asking receivers to articulate their challenges, motivations, and information needs during care transitions.[108]

Using a wide-variety of sources for data collection and reporting of outcomes

Transitional Care 1.0 interventions rely on medical record data, administrative billing data, and patient report to screen for patients and monitor outcomes. While these data sources remain important, a broader 2.0 approach would additionally collect baseline

and outcome data from informal caregivers, SHHCPs, receiving medical providers, and organizational leaders charged with improving care transitions. We have previously described examples of a broad range of data sources and outcome metrics that can be considered, including those related to care quality, functional status, caregiver burden, regional characteristics, and quality of life.[108]

Designing multi-faceted interventions

Coaches and navigators are the hallmarks of Transitional Care 1.0 interventions. These are often nurses tasked with several duties: assessing symptoms of recently discharged patients; being a "human discharge summary" and communicating information regarding the hospitalization to relevant stakeholders; promoting patient self-management; and ensuring follow up and implementation of the care plan. While important, people in these roles are serving as individual "transition-ists," representing Band-Aid approaches to system-level dysfunction. Transitional Care 2.0 calls for developing broader approaches, such as building research and infrastructure for regional and organizational information sharing and process redesign to reduce care fragmentation.

Summary of principles of the Transitional Care 2.0 framework

Transitional care 2.0 calls for developing broader perspectives that adopt a more holistic approach to research and interventions to improve hospital/SHHC transitions. We summarize key principles as follows:

- When identifying people at risk for receiving suboptimal transitional care, consider research and interventions to understand social and environmental determinants, rather than disease states alone.
- Develop research to identify indicators of high-risk *transitions*, instead of high-risk *people*.
- Define system-level processes that put health systems at risk for delivering suboptimal transitional care, and target these processes for intervention.
- Understand the cultural norms, incentives, and expectations that shape behavior in different healthcare settings involved in care transitions.
- Consider many sources of data as informative, especially data from receivers and data from the home environment.
- Develop research and interventions that go beyond coaches and navigators and instead focus on building infrastructure for information sharing and redesign of organizational processes.

Hospital/SHHC transitions remain a common, complicated, and costly problem. Current research and interventions leave critical gaps in the analysis of the work systems in which transitions occur. Future research should identify and evaluate contextual factors to develop an understanding of interactions within and across work systems during hospital/SHHC transitions. Principles of Transitional Care 2.0 can further complement current research and help develop the next generation of care transitions interventions.

Aims of the dissertation

Building on the Transitional Care 2.0 principles outlined in this paper, the overall objective of this dissertation is to identify system-level risk factors, process failures, and

outcomes affecting older adults' safety related to IM during their hospital/SHHC transitions. In Chapter 2, we first describe a HFE-informed assessment of key components of IM from the perspectives of SHHCPs directly responsible for executing older adults' transitions. We then describe IM-related process failures during the SHHC admissions process and initial home visit after hospital discharge. In Chapter 3, we use a HFE approach to first identify risk factors for IM-related process failures during initial home visits of older adults. We then characterize older adult, SHHCP, and organizational outcomes of IM-related process failures. Finally, we discuss strategies SHHCPs use to obtain needed information. In Chapter 4, we first summarize research findings from the analyses conducted for this dissertation. The remainder of Chapter 4 discusses implications for key stakeholders involved during hospital/SHHC care transitions: health systems, SHHC agencies, healthcare providers, older adults, and informal caregivers. The chapter concludes with implications for researchers and policymakers.

Data for these studies came from our large, multi-site qualitative study at five sites associated with three SHHC agencies in rural and urban sites across the US. The data we analyzed for this dissertation came from over 180 hours of observation (60 homecare visits lasting approximately 3 hours each) and approximately 80 hours of interviews of older adults, informal caregivers, SHHCPs, and SHHC administrators. The analyses in this dissertation represent a subset of a larger study whose overall goal is to develop an index used by SHHC agencies in real time to identify and reduce potential risks to older adults' safety during hospital/SHHC transitions.

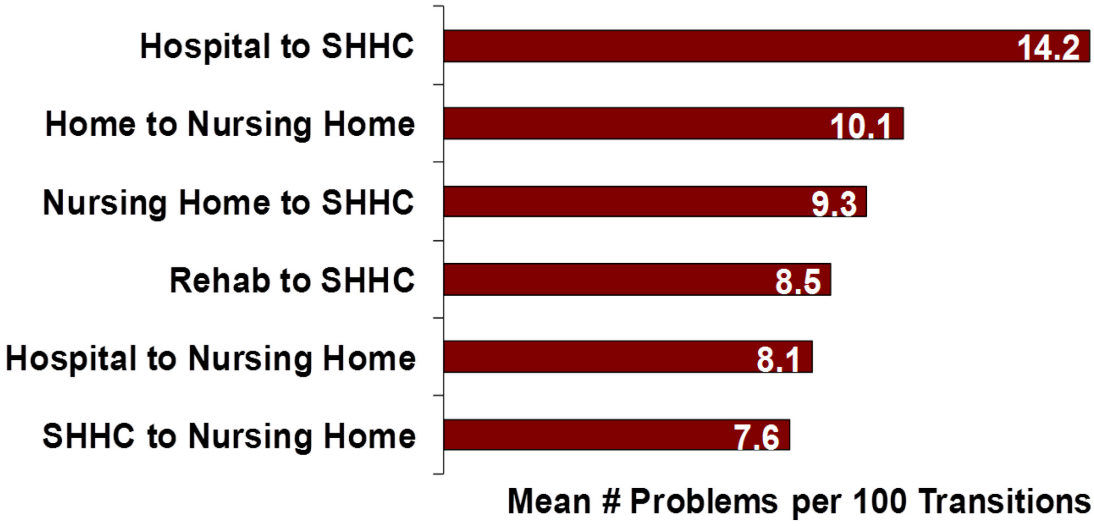


Figure 1: Problems by type of care transition

SHHC: Skilled home health care

*Table 1: Human factors engineering domains applied to evaluation and improvement of the hospital/SHHC transition**

HFE Domain	Example of Application to Improve Healthcare Delivery	Example HFE Methodology/Tools for Application to Improve Hospital/SHHC Transitions
Physical Ergonomics (e.g., anatomical, physiological, biomechanical, etc.)	Designing the work space to reduce the occurrence of serious safety events, such as falls [138-140] Designing work space and/or processes to reduce healthcare provider injury (e.g., due to repetitive movements, lifting/handling, etc.) [141]	Analysis of the physical environment of the hospital and the older adult's home to assess the ability of the older adult to navigate differences in layout after hospital discharge Environmental assessment of SHHCPs' mobile offices (e.g., car, corner café), including lighting, noise, amount of luggage needed, internet connectivity, and availability of supplies to determine potential impact on SHHCP health and on implementation of the care plan
Cognitive Ergonomics (e.g., memory, perception, reasoning, etc.)	Assessment of mental workload and situation awareness to inform design [142-144] Usability testing of medical devices and health information technology to improve safety and performance [145,146]	Analysis of cognitive aspects (e.g., decision making, short-term memory requirements) of SHHCP care transition tasks during the initial home visit to assess feasibility of incorporating interventions within current workflow Use of measures to assess older adult, informal caregiver, and SHHCP level of awareness of changing care plans as transition progresses
Macro Ergonomics (e.g., organizational structures,	Identification of barriers to safe delivery of care within complex work systems [99,105,111,147] Technology implementation and its effect on workflow and care processes [111,125,129,133,148]	Prospective risk assessment to determine potential risks to older adult safety upon arrival to the home Assessment of usability of medical devices used in the home (e.g., nebulizers, wound vacuum-assisted closure devices)

HFE Domain	Example of Application to Improve Healthcare Delivery	Example HFE Methodology/Tools for Application to Improve Hospital/SHHC Transitions
interactions within the work system, etc.)	Redesigning processes to improve team communication [128,149]	Assessment of organizational culture to identify barriers and facilitators to communicating with medical providers during the care transition

*We modified findings presented in prior work[109] to be relevant to transitions to the skilled home healthcare setting

HFE: Human factors engineering; SHHCP: Skilled home healthcare provider

Examples provided of HFE applications to improve healthcare delivery are not an exhaustive list. Additionally, the studies cited are only a representative sample of HFE applications within health care systems. For further reading on HFE applications within health care, refer to the following references: [88,98,102,133,150-155]

Table 2: Current care transitions interventions evaluated from a human factors engineering perspective

SEIPS Work System Element	Component of Existing Transitional Care Interventions	Aspect of Care Transition addressed by Component	Examples of Contextual Considerations addressed by HFE	Examples of HFE Approach Enhancements for Hospital/SHHC transitions
Work System *(Example: home, hospital, or skilled nursing facility)*	Current care transitions components have not explicitly described contextual considerations (e.g., effect on provider or patient workflow, unintended consequences, interactions among components of the healthcare system within or across care settings) in the implementation of the intervention.	Not formally addressed	Care transitions result in a change in work system from healthcare setting A to health care setting B. HFE considers the differences between the two work systems (setting A to healthcare setting B) and how those changes may affect the ability for the providers, patient, or informal caregivers to execute the care plan. This difference is integral to understanding how to optimize transition improvements.	Prospectively evaluate the work systems between which a patient is transitioning (e.g., hospital, SHHC agency, and home) to determine interactions among work system elements and obstacles to optimized performance, such as interactions between the ability of the caregiver and the caregiving tasks that have to be performed or the tools provided to perform them. Develop strategies or new processes to optimize safety and performance based on prospective evaluation, such as through failure modes and effects analysis. Establish how the creation of new roles (e.g., transition coach, guide, or navigator) may change the work of SHHCP and informal care providers.
Person *Any person or team of people that interacts*	Follow-up telephone call with the patient post hospital discharge [85,156-160]	Communicate with patients and caregivers during post discharge period.	Care transitions involve transfer of information among people with varying levels of knowledge, training, and skill	Determine ways to design the work system (e.g., hospital, SHHC agency, or home) to support distributed teamwork across clinicians, informal

SEIPS Work System Element	Component of Existing Transitional Care Interventions	Aspect of Care Transition addressed by Component	Examples of Contextual Considerations addressed by HFE	Examples of HFE Approach Enhancements for Hospital/SHHC transitions
within the work system. E.g., patient, informal caregiver, physician, nurse, rehabilitation therapist		Answer questions and identify/provide support for any needs or challenges	(clinicians, patient, informal caregivers). HFE considers the interaction among the following characteristics: Patient's clinical status Patient and informal caregiver health literacy levels Patient and informal caregiver's cognitive or functional ability affecting comprehension of care plan Ability and willingness of informal caregivers to support patient and assist with healthcare tasks Patient, caregiver, or clinician perceptions of what a care transition should involve and each person's role should be.	caregivers, and the older adult such as the design and implementation of health information technology to communicate and share information. Tailor interventions to the needs of the older adult, caregiver, or SHHCP by involving them in the design of new processes, interventions, and technologies. Ascertain the extent to which older adults and informal caregivers can manage the transition by analyzing their cognitive and physical abilities, motivation, and expectations for SHHC services. Assess how those person factors might interact with the work system (the tasks, the tools to perform the tasks, the environment in which the tasks are being performed, and the support they have to perform the tasks).
	Patient education provided during hospital discharge [156-159]	Promote patient- and family-centered care Patients and caregivers understand condition and plan of care		
	Timely communication with primary care provider [85,156,157,161,162]	Ensuring primary care provider is assuming responsibility for the care of the patient after the transition		
	Transition coach role created [156-160]	Communicate with patients and caregivers during post discharge period. Answer questions and identify/provide support for any needs or challenges Discuss any changes in care plan and provide support for managing self-care		

SEIPS Work System Element	Component of Existing Transitional Care Interventions	Aspect of Care Transition addressed by Component	Examples of Contextual Considerations addressed by HFE	Examples of HFE Approach Enhancements for Hospital/SHHC transitions
	Home visit during immediate post hospital discharge period [156,157,160-162]	Discuss any changes in care plan and provide support for managing self-care		
Technology/ Tools *The objects and technological objects used to perform the tasks. E.g., the electronic medical record*	Follow-up telephone call with the patient post hospital discharge [85,156-160]	Communicate with patients and caregivers during post discharge period Answer questions and identify/provide support for any needs or challenges	HFE considers the availability and usefulness of tools and technology to each person involved in the care transition. Assess needs for technology and tools to support the care transition in each work system involved Examples include: Patient and caregiver access to telephone lines and internet Ease of usability of equipment for patients and caregivers	Evaluate currently used tools and technology for effectiveness, usability, and acceptability—e.g., SHHCP laptops, home medical devices. Use participatory design techniques to design user-centered technology and tools, such as information technology portals to share information about the care plan.
	Patient-centered discharge instructions [85,156-160]	Promote patient- and family-centered care Patients and caregivers understand condition and plan of care		
	Post-discharge hotline provided [156-159]	Communicate with patients during post discharge period		

SEIPS Work System Element	Component of Existing Transitional Care Interventions	Aspect of Care Transition addressed by Component	Examples of Contextual Considerations addressed by HFE	Examples of HFE Approach Enhancements for Hospital/SHHC transitions
Tasks *Any actions performed within the work system.*	Follow-up telephone call with the patient post hospital discharge [85,156-160]	Communicate with patients during post discharge period Answer questions and identify/provide support for any needs or challenges	HFE considers the complexity of care and level of workload of transitions-related tasks for providers, patients, and caregivers Identification of workarounds developed by providers, patients, and caregivers to make tasks easier	Analyze SHHCP tasks and workflow, how they can be made safer and more efficient, and how they interact within the work system at the older adult's home Predict the success and/or failure of a new task (e.g., wound care) based on how it will interact within the older adult's work system at home Determine how new tasks (e.g., physical therapy) might lead to changes to elements of the work system (e.g., rearrangement of layout of home) Assess how the difficulty and workload associated with the introduction of new tasks (e.g., treatment plans) in the home may affect their ability to be successful and/or sustainable.
	Patient education provided during hospital discharge [156-159]	Facilitate patient and family-centered care Patients and caregivers understand condition and plan of care		
	Home visit during immediate post hospital discharge period [156,157,160-162]	Discuss changes and provide support for managing self-care		
	Medication reconciliation pre hospital discharge [85,156,157]	Conduct medication reconciliation and provide support for medication management		

SEIPS Work System Element	Component of Existing Transitional Care Interventions	Aspect of Care Transition addressed by Component	Examples of Contextual Considerations addressed by HFE	Examples of HFE Approach Enhancements for Hospital/SHHC transitions
Organization *Determines the policies, procedures, and culture of the system. E.g., the safety culture*	Timely communication with primary care provider [85,156,157,161,162]	Open and timely communication among healthcare providers Clear and timely communication of the plan of care	HFE considers the effectiveness of teamwork and level of shared situation awareness during care transitions Level of support for patient safety initiatives from organization executives Awareness of outpatient providers regarding the patient's transition and care plan	Understand how SHHC organizational factors, such as for-profit versus not-for-profit status, shape the care delivered by the SHHC agency Determine how current care transitions initiatives are implemented and accepted by SHHC staff. Investigate how SHHC organizational factors would interact with a new policy on information transfer during transitions Design of health information technology systems where hospital and SHHC providers can gain real-time information about the older adult's status to promote teamwork and shared situation awareness.
	Formulation of care plan by multidisciplinary team [161,162]	Open and timely communication among healthcare providers		
Physical Environment *The physical environment a person operates within. E.g.,*	Home visit during immediate post hospital discharge period [156,157,160-162]	Discuss changes and provide support for managing self-care	How well the physical is designed to support care transitions-related work Whether changes to the home environment lead to challenges	Determine whether interventions are feasible based on the resources in the home setting Identify barriers in the home environment that may limit the success of the intervention, such as

SEIPS Work System Element	Component of Existing Transitional Care Interventions	Aspect of Care Transition addressed by Component	Examples of Contextual Considerations addressed by HFE	Examples of HFE Approach Enhancements for Hospital/SHHC transitions
the patient room, the patient home			Safety risks in the environment (e.g., throw rugs that may lead to a fall) Design of the patient's home that may lead to transition challenges (e.g., second floor only bathroom)	drastic changes in support for activities of daily living, and design interventions to support patients during transitions in light of these barriers
External Environment *Any outside factor affecting tasks performed in the system. E.g., insurance policies*	Not formally addressed	Not formally addressed	Identify how external factors such as payment models and the regulatory environment may impact the transition	Investigate how these factors can be improved to support the intervention, such as alternative models for reimbursement or reporting of metrics

HFE: Human factors engineering; SEIPS: Systems Engineering Initiative for Patient Safety; SHHC: Skilled home health care

Table 3: Characteristics of a broader approach to improve hospital/SHHC transitions

	Transitional Care 1.0	**Transitional Care 2.0**
Screening	Patient-level risk factors, e.g., medical conditions	Older adult and caregiver cognitive and functional status, health literacy Home environment Hospital-level risk factors SHHC agency-level risk factors Regional characteristics
Target processes	Discharge planning Communication Medication reconciliation	Older adult and caregiver preferences Caregiver activation Information management Role ambiguity Systems redesign
Settings	Hospital	SHHC agencies Ambulatory care Assisted living Home
Data sources	Medical records Administrative data Patient report	Organizational data Caregivers SHHCP Medical providers
Intervention	Coaches Navigators	Regional health information exchange Shared information platforms Organizational process re-design Integration of community-based resources Technology to support home-based care

SHHC: Skilled home health care; SHHCP: Skilled home healthcare provider

Chapter 2. A human factors engineering assessment of information management during care transitions of older adults receiving skilled home healthcare services after hospital discharge

Abstract

Background: Older adults who require skilled home health care (SHHC) services following hospital discharge are among those at highest risk of experiencing suboptimal outcomes during care transitions. Information management (IM) refers to the ability of skilled home healthcare providers (SHHCP) to collect, organize, and communicate older adults' care plans to key stakeholders. Optimal IM is critical to ensure patient safety during a care transition from hospital to home, yet little is known about IM during this care transition. Human factors engineering (HFE), a systems science that investigates factors affecting human performance, may be used to understand risks and outcomes experienced by older adults receiving SHHC services after hospital discharge.

Objectives: We used a HFE approach to: 1) identify key components of IM from the perspectives of SHHCPs directly responsible for executing older adults' transitions; and 2) describe IM-related process failures during the SHHC admissions process and initial home visit after hospital discharge.

Methods: This was a qualitative study primarily guided by the HFE-informed Information Chaos framework, which groups IM-related process failures (i.e., information problems that may contribute to errors) that contribute to suboptimal IM into five categories: information overload (too much information), information underload (too

little information), information scatter (information in many places), information conflict (information not matching other information), and erroneous information (incorrect information). We interviewed 33 SHHC administrative staff to obtain contextual information about the SHHC admissions process (~24 hours after hospital discharge) and initial home visit (~48-72 hours after hospital discharge). We directly observed interactions among SHHCPs, older adults, and informal caregivers during the initial home visit after hospital discharge (n=60 visits). Following each visit, we interviewed the older adults (n=60), informal caregivers (n=40), and SHHCPs (n=46) involved. Participants were admitted to SHHC at five sites associated with three SHHC agencies in rural and urban sites across the US. Both field notes and audiotapes of interviews were transcribed, coded, and analyzed. Themes, subthemes, and information flow diagrams were generated.

Results: We identified four action steps involved in the flow of information during the SHHC admissions process primarily taking place in the hospital and at the SHHC agency: 1) prepare referral and inform agency; 2) verify insurance; 3) contact older adult; and 4) review case to schedule visit. We subsequently identified four action steps involved in the flow of information during the initial start-of-care (SOC) home visit: 1) assess appropriateness for SHHC and obtain consent for treatment; 2) manage expectations; 3) ensure safety; and 4) develop contingency plans and recovery scenarios. Within each of these action steps, we identified examples of IM-related process failures: too much information for older adults to process upon hospital discharge (information overload); SHHCPs without access to complete information during the SOC visit (information underload); SHHC coordinators needing to access information from

multiple places to prepare the initial referral (information scatter); older adult and informal caregivers' mismatched expectations regarding what SHHC services they will actually receive, compared with what they were told in the hospital (information conflict); and SHHCPs encountering wrong diagnoses or medication lists during the SOC visit (erroneous information). We also identified important characteristics of IM during hospital/SHHC transitions: overlap among roles, tasks, information sources, and information targets; propagation of IM-related process failures over time; and variation in IM across study sites.

Conclusions: Understanding IM during hospital/SHHC transitions elicited factors influencing the quality of care delivered during this particularly high-risk transition. IM required a high reliance on others (e.g., hospital staff, SHHC staff, older adults, informal caregivers) for success to reduce the risk of propagating IM-related process failures throughout the care transition. However, SHHCP often did not have access to complete and correct information during the SOC visit, nor did they have easy access to the sources of that information. This suggests that clinical and organizational infrastructure was not in place to adequately support IM during the hospital/SHHC transition.

Key Words: transitional care, home care services, human factors engineering, qualitative research, frail elderly, information management, home care agencies, patient safety

Introduction

Care transitions remain suboptimal

Problems during care transitions of older adults are common, costly, and sometimes lead to adverse events.[4,9,108] After two decades of research focused on reducing such problems, unfavorable outcomes persist. Readmissions rates remain high, and older adults are often dissatisfied with the quality of their care.[16,18,163] Older adults who require skilled home health care (SHHC) services following hospital discharge are among those at highest risk of experiencing suboptimal outcomes during care transitions.[17,25,164] SHHC are services provided by healthcare professionals (e.g., nurses, rehabilitation therapists) in a residential environment. Hospital readmission rates from the SHHC setting are approximately 25%, with most occurring within 2 to 4 weeks after hospital discharge.[165,166] Although interventions exist to improve care transitions from hospital to home,[63,85,159,160,167] given that re-hospitalization rates from SHHC settings remain high,[29,164] interventions that account for the complexity of the hospital to SHHC transitions are still needed.

Information management and patient safety in the context of care transitions

Information management (IM) is an important component in managing care transitions. There are no standardized approaches in the literature for how to define or evaluate IM during care transitions; descriptions of IM generally characterize how healthcare professionals track and transfer health information over time.[32,41-45] Literature on IM has discussed several elements as being important: communication among healthcare professionals and patients, transfer of key data elements (e.g., medical history, medication regimens, follow-up appointment times, contact information for key team

members), and the role of information technology to both help and hinder IM.[32,38,43,46-50] In this paper, IM refers to the ability of skilled home healthcare providers (SHHCPs) to collect, organize, and communicate older adults' care plans to key stakeholders (e.g., other SHHCP, medical providers, older adults, informal caregivers) during the care transition.

IM during care transitions from hospital to home care, henceforth referred to as "hospital/SHHC transitions," has unique characteristics and challenges deserving of further study. Older adults are transitioning under a time-pressured situation, with incentives to execute hospital discharges in the mornings to enhance hospital patient throughput.[35,36] Thus, healthcare providers executing the transition may not have adequate notice of the older adults' discharge to prepare for the transition, and the older adult may have a rapidly changing clinical status affecting needs post-discharge. Additionally, SHHCPs (e.g., home care nurses) have difficulties obtaining the information they need to develop care plans, since hospital-based medical team members are not easily accessible, and SHHCPs are often practicing "between medical record systems."[37-40] Unlike transitions to other facilities, hospital/SHHC transitions also involve transfer of responsibility and authority to laypersons. Laypersons may not be adequately trained to implement the care plan at the time of hospital discharge. Finally, the care transition is a vulnerable period for older adults and their informal caregivers, as they may be overwhelmed with information and not have the adequate support systems to process this information.[32-34]

IM is a critical process to ensure transition safety, yet little is known about IM during hospital/SHHC transitions. Most studies of IM have one or more of the following

limitations: data from only one stakeholder perspective (e.g. patient, nurse, doctor); data from an individual healthcare setting (e.g., hospital unit); or data from one portion of the care transition (e.g., hospital discharge).[32,45,48,49,51-55] Few studies address more than one of these limitations, which is needed for a more comprehensive understanding of IM during hospital/SHHC transitions. Further, there is little understanding about the *IM-related process failures* (i.e., information problems that may contribute to errors)[56] that can result from suboptimal IM during transitions. IM-related process failures, described further below, occur when IM fails to achieve its intended outcome.

Human factors engineering approach to care transitions

Input from disciplines within safety science can strengthen care transitions improvement efforts. Current interventions to improve care transitions target specific patient populations (e.g., those with congestive heart failure), specific settings (e.g., hospital unit, skilled nursing facility), or specific processes (e.g., medication reconciliation, discharge planning). These interventions, while useful, do not employ a broader systems approach that includes examining healthcare provider and patient incentives shaping behavior and performance. Other approaches are needed to complement and enhance existing interventions.

Human factors engineering (HFE) is a scientific discipline that uses qualitative and quantitative methods to proactively understand risks in complex systems by evaluating the factors in a system that affect human performance.[109] HFE studies interactions among people (e.g., older adults, informal caregivers, healthcare providers) and elements of their *work system* (e.g., hospital unit, SHHC agency, older adult's home) to optimize performance and reduce harm.[21,102,107,168] Many, including the Institute of

Medicine, have called for applications of HFE to evaluate care coordination, improve care transitions, and develop tools customized for home-based health care.[107-111]

Conceptual frameworks guiding this study

Systems Engineering Initiative for Patient Safety framework

The Systems Engineering Initiative for Patient Safety (SEIPS) 2.0[113] served as the overarching conceptual framework for the current study (see Appendix, Figure 13). SEIPS 2.0 is a HFE work system model that describes a structured work system of 6 elements: (1) *people* – e.g., SHHCP, older adults, informal caregivers, physicians (2) the *tasks* people perform; (3) the *tools and technology* available and needed to complete the tasks; (4) *organizational* factors shaping the work, such as staffing, policies, teamwork, coordination, communication; (5) factors related to the *physical environment* in which work is performed; and (6) features of the *external environment*, e.g., insurance regulations, cultural norms. These elements interact to constitute processes (e.g., IM) that produce outcomes (e.g., medication adherence, improved health, job satisfaction).[113-115]

Information Chaos framework

To understand the specific process of IM, we also incorporated a complementary conceptual framework (see Appendix, Figure 14). The Information Chaos framework[56] uses a HFE approach to categorize five information-related process failures (i.e., information problems that may contribute to errors) that comprise information chaos (confusion and disorganization). These five process failures represent failures of the IM process: information overload, underload, scatter, conflict, and erroneous information. A team of HFE researchers and family practice physicians investigating process failures in primary care settings first conceptualized this framework. The authors argue these

process failures increase the risk of information-related errors by contributing to impaired situation awareness and increased mental workload. Researchers have also used this framework to study handoffs between community pharmacists.[169] We used the Information Chaos framework to understand the hospital/SHHC transition, and we describe each information-related process failure in the subsequent paragraph.

Information overload during hospital/SHHC transitions occurs where there is so much information that the person (SHHCP, older adult, or informal caregiver) has difficulty identifying which piece of information is relevant (e.g., a medical record with too much detail). The person is unable to easily organize, synthesize, interpret, or act upon the information. *Information underload* occurs when information needed to perform the task is missing (e.g., key aspects of the medical history are missing). *Information scatter* is when the needed information is located in multiple places (e.g., medical record, administrative databases, older adult's home, physician's office). *Information conflict* exists when the person is unable to determine which pieces of conflicting information are correct (e.g., medication discrepancies). Finally, *erroneous information* refers to information that is wrong (e.g., incorrect address, incorrect medication dose).

Objectives of the study

In order to guide hospital/SHHC transition improvement efforts, the objectives of this paper are to: 1) identify key components of IM from the perspectives of SHHCP directly responsible for executing older adults' transitions; and 2) describe IM-related process failures during the hospital/SHHC transition.

Methods

Design

This was a qualitative study. Using ethnographic methods, this design provided insight into work as it unfolded *in situ,* including the lived experiences and perceptions of participants in the specific context of their environment, an advantage for studying work across care settings.[170] This chapter presents a portion of the data collected for a larger study during the following transition time frame (see Appendix, Figure 12): starting from just prior to hospital discharge, extending through the first SHHC home visit (a.k.a. the "start-of-care" visit), and ending approximately 24 - 48 hours after the start-of-care (SOC) visit. Data collection took place in the hospital, at the SHHC agency, and in the home. For this paper, we report on the subset of the data specifically informing the SHHC admissions process (~24 hours after hospital discharge) and the SOC visit (~48-72 hours after hospital discharge).

Following the recommended approach to data collection for qualitative research, we used multiple methods.[171] We first conducted direct observations and contextual inquiry[172] of the SHHC admissions process and SOC visit, during which researchers (myself and a human factors engineer) directly observed work being performed and asked probing questions (e.g., to clarify or to gain a more in-depth understanding of what was observed and the motivation underlying people's work). We then conducted semi-structured interviews with older adults, in combination with their associated informal caregiver(s) (defined as any non-paid individual that participated regularly in the care of the older adult). We also conducted separate interviews with the SHHCP assigned to provide care in the home, the hospital-based SHHCP who initiated older adults'

transitions from the hospital, and SHHC administrators and staff involved in transitions. The SEIPS and Information Chaos frameworks guided the interviews, which focused on key components, barriers, and facilitators to successful IM during care transitions (Appendix, Figures 13 and Tables 9-11). Interviews included probing questions on the following aspects of IM: sequence of tasks; how, where, and by whom tasks were performed; variations in the tasks, tools, and technologies used to perform tasks; and, strategies used to overcome observed or voiced challenges to task completion. Interviews lasted approximately 45 minutes and were audiotaped and transcribed. Field notes were also transcribed electronically to facilitate analysis.

Settings and Participants

Participants were admitted to SHHC at five sites associated with three SHHC agencies in rural and urban sites across the US. Sites 1 and 2 were part of a not-for-profit agency in a large metropolitan city. They provided care for racially, ethnically, and economically diverse communities with complex care needs. Sites 3 and 4 were part of a for-profit agency serving rural (Site 3) and urban/suburban (Site 4) communities. Site 5 was a not-for-profit agency affiliated with an academic medical center in a moderate-sized city. Table 4 summarizes key characteristics of each site and the number of transitions we observed at each site.

We used a combination of purposive and network sampling[173] to identify SHHC administrative staff involved in executing or overseeing hospital/SHHC transitions. We interviewed 33 staff (intake staff, visit schedulers, clinical team managers, quality improvement officers, executive leadership) to obtain contextual information about the

SHHC admissions process (~24 hours after hospital discharge) and initial home visit (~48-72 hours after hospital discharge).

We then identified English- or Spanish-speaking older adults ≥ 65 years of age referred for SHHC services after hospital discharge. The participating SHHC agency would inform us of new referrals. We approached older adults either in person before hospital discharge, or by phone the day after hospital discharge. All older adults referred to the participating SHHC agency were eligible for the study, regardless of diagnosis. We obtained consent from the SHHCP assigned to visit the older adult in the home, and the older adult (or the older adult's legally authorized representative, if applicable). We directly observed interactions among SHHCPs, older adults, and informal caregivers during the SOC visit after hospital discharge (n=60 visits). Following each visit, we interviewed the older adults (n=60), informal caregivers (n=40), and SHHCPs (n=46) involved. This study was approved by the Johns Hopkins School of Medicine Institutional Review Board and the review boards at participating sites.

Approach

The data we analyzed for this paper was comprised of over 180 hours of observation (60 homecare visits lasting ~3 hours each) and ~80 hours of interviews of older adults, informal caregivers, SHHCPs, and SHHC administrators. To characterize the flow of information, we used HFE methodology employed in our previous work,[40] which involved analysis of field notes, grouping of observed tasks, creating process-flow diagrams, and reviewing diagrams with SHHC subject matter experts. We applied both the principles of inductive reasoning, and our conceptual frameworks to guide data analysis and interpretation, an approach particularly useful for health services research.[174]

The Information Chaos framework guided directed content analysis. We used an iterative approach to create our coding framework and generate themes and subthemes.[175,176] Two researchers (AIA, AH) reviewed all transcripts and identified items related to IM. These became first-order codes consisting of terms, concepts, and categories originating from the participants themselves.[177] Four researchers (AIA, AH, APG, BL) combined these codes into second-order codes representing components of IM and IM-related process failures within the Information Chaos framework. We coded portions of the transcripts under multiple categories, if appropriate. We continued to create codes inductively within each domain of the framework. Additionally, we used the following predetermined codes to facilitate data analysis: transition time period (hospital discharge, SHHC admissions process, SOC visit, time after SOC visit), participant type (older adult, informal caregiver, SHHCP, SHHC administrator). We also identified emergent codes, i.e., codes representing ideas not falling within the information chaos framework or our predetermined codes. The research team discussed differences in coding and reconciled these differences by consensus. ATLAS.ti qualitative data management software was used to facilitate analysis.[178] See Appendix, Table 12 for an overview of the analytical coding framework. We documented our analyses by creating research memos for each query in Atlas.ti, a practice recommended by qualitative researchers.[179] We reviewed the resulting quotes to identify common themes.

Results

Participant characteristics

The 60 older adults (68.3% female; 65.0% Caucasian, 15.0% African-American, 13.3% Hispanic, 1.7% Asian) had an average age of 73.8 years (range=48-98 years). The

40 informal caregivers (62.5% female; 32.5% Caucasian, 17.5% African-American, 5.0% Hispanic, 2.5% Asian) had an average age of 62.9 years (range=21-87 years). The 46 SHHCPs (93.5% female, 26.4% Caucasian, 23.9% African-American, 4.0% Hispanic, 4.4% Asian) had an average age of 43.5 (range=27-67), an average of 16.4 years of experience (range=3-31 years), and their average number of years practicing in the home care industry was 11.8 years (range=0.5-33 years). SHHCPs were 69.6% nurses, 19.6% rehabilitation therapists, and 8.6% administrators or SHHC coordinators. The 33 key informants (87.9% female, 69.7% Caucasian, 18.2% African-American, 3.0% Hispanic, 6.1% Asian) had an average age of 48.0 years, had an average of 22.5 years of experience (range=4-42 years), and their average years practicing in the home care industry was 16.5 years (range=2-35 years). See Appendix Tables 13-16 for the complete demographics for each site and for the overall study.

Overview of presentation of information flow, key IM components, and IM-related process failures

We describe the flow of information and key components of IM during the two phases of the hospital/SHHC transition that are the focus of this study: SHHC admissions process and SOC visit. We also describe the five information-related process failures resulting from poor IM. In the sections that follow, presented chronologically for each phase of the transition, we support and illustrate our findings by presenting representative quotes and examples from our data. To demonstrate that the concepts we present are representative of our data, we provide examples from a variety of participants and settings. Reflective of our triangulation efforts to capture different dimensions of the

same phenomenon during data collection and analysis, we report data examples supported by participant reports and researcher observations.

SHHC admissions process phase

This phase began around the time of hospital discharge and ended approximately 24-48 hours after hospital discharge. The medical team had already decided to refer the older adult for SHHC services. The older adult may still have been in the hospital, or they may have just have been discharged. During this phase, the majority of activity took place at the hospital and at the SHHC agency. Figure 2 depicts the key IM activities/components during the SHHC admissions process, the data needed for each activity, the information sources/managers/targets, the principal mode of communication used, and the quality of the information gathered from information sources. The information flow diagram is a general representation of the process observed at all five sites. We identified four action steps involved in the flow of information during the SHHC admissions process: 1) prepare referral and inform agency; 2) verify insurance; 3) contact older adult; and 4) review case to schedule visit. We describe each in detail below and provide illustrating examples with representative quotes. Table 5 summarizes the information manager(s), IM-related process failure(s), and information quality for each step of the admissions process.

Step 1: Prepare referral and inform SHHC agency

Key IM components: Information gathering, information transmission

The primary "information manager" (i.e., the person who gathers info and uses it) during this stage was the home care coordinator and the home care coordinator's assistant (if present). The SHHC agency employed home care coordinators in the hospital setting

to evaluate patients potentially in need of SHHC services. The home care coordinator was responsible for gathering relevant information into one place to develop a complete picture of the status of the older adult's needs in order to begin developing a post-discharge care plan. The coordinator had this responsibility in part because there was not a centralized, integrated existing source of relevant information to execute the hospital/SHHC transition.

The home care coordinator found out about possible referrals via attendance at multi-disciplinary rounds, or the coordinator found out directly from the case manager. The home care coordinator experienced *information scatter* during this activity, because coordinators needed information from multiple sources (e.g., medical team, electronic medical record (EMR), paper chart, case manager/social worker). The home care coordinator needed to use multiple modes of communication (phone, fax, electronic, face-to-face) to perform tasks. There may also have been *information conflict* to resolve, if there were discrepancies in the care plan documented in the EMR versus the plan documented in the discharge instructions. In terms of information quality, the information needed (e.g., demographics, services needed) may not have been present, or may not have been accurate in the EMR, and the medical team was not easily accessible for clarification. Attending multi-disciplinary rounds, if easily accessible, provided the most efficient way to manage information during this IM activity, as indicated by multiple home care coordinators.

The following is a quote from a home care coordinator at Site 5 describing how she gathered information to prepare a referral for the SHHC agency. She highlighted the importance of both her background as a nurse, and her experience as a former SHHCP in

the home, in shaping her approach to information gathering and transmission. Underlined items represent IM-related process failures.

> *(P86:223:270): "… I was a home care nurse in the field, and having that experience I know that what [information] is important [to include in the referral] … You want to give the snap shot of the patient on the referral, why they were in the hospital, …we do have to read the notes [in the electronic medical record], … [some information] is not in the electronic medical [at this hospital] … that is where you would have to go to the [paper] chart to find. When I go to the chart I also skim the physician's orders and make sure that the medications match up especially if it's a high risk medication …, or if [there is other information] … that may have to be put on my referral that was not [told to me by the social worker] … they are … not nurses, … I'm the one that has to go in with the expertise of my training … and make sure that [information] is on the referral for the home care nurse in a way that that could be understood …*
>
> *[Interviewer]: … normally is all the information in one particular location or do you have to kind of search for it …?*
>
> *[Home care coordinator]: No, you search (laughter) yes, you definitely search back and forth … everyone does it a little bit differently…"*

Confirming the presence of information scatter, a home care coordinator at Site 4 described in the following quote the different ways she received notice of an older adult in need of SHHC services.

> *(P129:53:53): "… everybody kind of works differently, but some [hospitals] I copy the chart and the things I need out of it. Some [hospitals] send [patient information] via an eDischarge system, and then it comes across my e-mail and I can go meet with the family and pull up the information on my phone."*

Another home care coordinator at Site 4 highlighted an example of information conflict when preparing a referral and the importance of her role in resolving the conflict as a way to reduce the risk of patient harm.

> *(P131:238:240): "… the more information you can give that [SHHCP in the home] the better. … You know, the [physical] therapist is saying [the patient is]*

> *non-weight bearing at the hospital, but the doctor is ordering physical therapy, then we're going to get out there [to the home] and we're going to be doing some damage, … you cannot have too much information when it comes to transitioning a patient. … And it's just getting all those little puzzle pieces put together before the puzzle is given to the [SHHCP]. … It's too late for them to have to put it together. [The SHHCP is] already there, focused, taking care of the patient, I don't need [them] to have to try to … coordinate … all this [information], that's taking time from the patient…. that's where our role comes in, you know. The better the transition is, the better the outcome."*

Step 2: Verify insurance

Key IM components: Information verification

The primary information managers during this step were administrative staff at the SHHC agency, often called "intake staff." These staff used the information from the referral prepared by the coordinator and supplemented it with information from the EMR (if they had access to it) and from their own administrative databases. There is typically little to no face-to-face communication during this activity. Intake staff experienced *information scatter* and *information conflict* during this activity. For example, insurance benefit information may have been located in multiple places with limited accessibility (information scatter). In addition, insurance information as reported on the referral may have been different from what was listed in other databases (information conflict). Despite these challenges, the referral remained the most accessible and useful source of information during this IM activity.

Step 3: Contact older adult

Key IM components: Information gathering, information transmission, information verification

The administrative staff were the main information managers during this IM activity. They may have been the same intake staff as in the prior step. The goal of this activity was to initiate contact with the older adult and obtain initial consent for a SHHC provider to visit the home. The main modes of communication were use of the telephone and the computer. Administrative staff experienced *information underload* or *information conflict* during this activity, as the demographic or contact information needed to reach out to the older adult or informal caregiver may have been missing or not match what was written in the referral. Additionally, the older adult may have said that they were not expecting home care, or that they were not in agreement with receiving SHHC services. The older adult and their informal caregiver may have been difficult to access during this IM activity (e.g., not answer the phone, not return phone calls), since they just returned from the hospital and the situation may have been unsettled.

Step 4: Review case and schedule visit

Key IM components: Information review, information transmission

The administrative staff ("schedulers") and the team manager were the main information managers. Schedulers were often non-clinical personnel responsible for assigning newly referred patients to available SHHCPs. The team manager was a typically an experienced nurse and former SHHCP who supervised a group of SHHCPs (e.g., nurses, rehabilitation therapists) serving a particular patient population or geographic region. The team manager briefly reviewed the case and determined how quickly the home visit must be scheduled and which team member was best able to take the case (based on the complexity of the case, geographic area, experience of the team member, and team members' workload). The manager also suggested additional home

care services (e.g., speech therapy, social work) based on the initial review. The team manager might have "overridden" a scheduler's assignment of a patient to a SHHCP, if the manager felt another SHHCP would have been more appropriate. There were multiple modes of communication during this activity (e.g., reviewing electronic records, emails/calls to staff), but typically no face-to-face communication.

Administrative staff experienced *information underload* during this activity, as information regarding the care plan may have been missing or may not have been comprehensive. For example, in an effort to streamline the transfer of information, some information may have been lost, as illustrated in the quote below from a key informant who was a SHHCP at Site 1. Additionally, schedulers may not have been aware of SHHCP workload when scheduling SOC visits and may have unduly burdened SHHCPs.

> *(P4:97:97): "… [The SHHC organization is] streamlining the amount of information that we're getting in our computer, … other than the demographics of where [the patient] live[s], the phone number, the contact information – and sometimes that is not even correct. … We used to get … a little bit of a summary regarding why the patient was hospitalized. And sometimes, not always, we get a list of the medications; but more often than not, that's not there…"*

Summary of IM-related process failures and information quality during the SHHC admissions process

We present two examples illustrating the concepts presented in the previous sections. The following is a quote from a key informant interview with a home care coordinator at site 2 who was preparing the referral just after identifying an older for home care. Here the coordinator walked the interviewer through the steps taken to initiate the hospital/SHHC transition. Items in boldface type represented key IM activities/components and to which step in the process they corresponded. Underlined

items represented IM-related process failures. The quote also highlighted the boundary of the IM activity as ending once the older adult was scheduled for a home visit.

> *(P94:4:56): "...you **gather the information** [step 1], you **get a verbal consent** [step 3] from the patient or from the families that they're willing to accept ... [home care]. Once [consent] is established, we wait for the authorization or **verification of their insurance coverage** [step 2] ... we then write a comment at the bottom, a narrative comment [with any details we feel the SHHC agency needs to know]. ... **I see the patient** [step 3], if, if they're in the hospital. And if ... they're already discharged ... **we do telephonic** interview [step 3]. So we have standard of questions that we ask. As I said where they live, where their family member. Do [they] **agree to [home care]** [step 3]? ... once we get the authorization and we release the case, meaning ...[w]hen our visiting nurses [are **scheduled**] [step 4] ... to see the patient at home, then the **communication primarily stops there**. ... basically our policy is once the nurse or the therapist has come to the home, that would be their contact person moving forward, but if the patient is having problem with a nurse or physical therapy, social worker at home or the nurse have not showed up or any of that then I get a phone call."*

In the following quote, a SHHCP from site 5 described aspects of information scatter and information conflict. The quote also demonstrated steps the SHHCP took to reduce the risk of information underload and prepare for the SOC visit just prior to arriving to an older adult's home (see next chapter for more details on strategies SHHCPs take to mitigate process failures).

> *(P47:1:3): "...so I received an email referral from our scheduler saying that this patient needed to be seen today, so **through the email referral I was able to get a little bit of information** [step 1] on her past medical history and why she needed to be seen. **… I looked at the referral again** [for the medications] [step 1] ... there was a **discharge medication list** [with the patient that I reviewed] [step 1] ... [I also] reviewed her [**hospital admission history and physical**] [step 1] and there was a section that talked a little bit about what was done for her so I reviewed that first ... I [called the daughter] if she had a copy of the **discharge papers** [step 3] from the hospital [so] she could have that out for me, because there are times [that my] discharge information may be different than what the patient actually comes home with. ... **The patient comes home with a more updated version** [step 3] ... I also asked her if she could also have the patient's*

> ***Medicare card*** *[step 3] and all of her* ***medications – including the bottles, not just the list.*** *[step 3] … that helps me when I get to the home that* ***all of that is there and available.****"*

In summary, there were multiple IM-related process failures affecting information managers during the SHHC admissions phase. The SHHC referral was the most important document, a type of "lifeline," for transmitting information. It was the only document containing information tailored specifically for SHHC staff and providers. When preparing the SHHC referral, home care coordinators obtained the most useful information from face-to-face interactions with medical staff and case managers. The challenge, however, was that these face-to-face interactions were difficult to arrange given the need for multiple people to be together at the same time. Despite home care coordinators' best efforts, the referral did not necessarily provide comprehensive information about the older adult's plan of care, due to physical space limitations and limitations on home care coordinators' access to information. Hence, administrative staff had very limited information on which to base the scheduling and staffing of home visits. In these cases, suboptimal IM affected the timing of home visits and resulted in the inability of staff to meet older adults' needs. Additionally, older adults and informal caregivers during this phase had mismatched expectations regarding the need for SHHC services, especially because they generally had a limited understanding of the nature of SHHC. We again refer the reader to Table 5 for a summary of the information manager(s), IM-related process failure(s), and information quality for each step of the admissions process.

Start-of-care (SOC) visit phase

The SOC visit took place in the home about 48-72 hours after hospital discharge. Figure 3 depicts the key IM activities/components during the SOC visit, the data needed for each activity, the information sources/managers/targets, the principal mode of communication used, and the quality of the information gathered from information sources. The information flow diagram is a general representation of the processes observed at all five sites. We identified four action steps involved in the flow of information during the SOC visit: 1) assess appropriateness for home care and obtain consent for treatment; 2) manage expectations; 3) ensure safety; and 4) develop contingency plans and recovery scenarios. We describe each in detail below and provide illustrating examples with representative quotes. Table 5 provides a summary of the information manager(s), IM-related process failure(s), and information quality for the SOC visit.

Step 1: Assess appropriateness for home care and obtain consent for treatment

Key IM components: Information gathering, information verification, information updating

The primary information manager during this IM activity was the SHHCP, typically a nurse but sometimes a physical therapist. The SHHCP spent time right before and during the initial part of the SOC visit determining if the older adult was appropriate for home care services, i.e., not too complex to manage at home, and not too well to need skilled services. The SHHCP also spent this time identifying whether there was an informal caregiver to assist with implementation of the care plan, or whether the older adult themselves was able to appropriately self-manage their conditions. If the older

adult appeared appropriate for home care services, the SHHCP obtained written consent for treatment. The SHHCP used multiple modes of communication during this IM activity, mostly relying on reviewing the referral and hospital discharge paperwork, and on face-to-face discussions with the older adult and informal caregiver (if present).

SHHCPs experienced *information scatter* during this activity, as the SHHCP had to obtain information from multiple sources (e.g., referral, hospital discharge paperwork, EMR, medical team, older adult, informal caregiver, and the home environment itself). There was also potential for *conflicting or erroneous information,* especially around medications. Medication lists taken from the hospital discharge paperwork often (>80% of the time in our observations) did not match the list of medications the older adult was taking once they arrived at home. See Plate 1 for photographs we took of an older adult's bathroom demonstrating the complexity of sorting through medications. The SHHCP needed to use multiple modes of communication (phone, fax, electronic, face-to-face) to perform tasks. The older adult and informal caregiver may also have had conflicting opinions about the need for home care, or they no longer wanted home care services once the older adult is out of the hospital. Finally, SHHCPs experienced *information underload* regarding how to implement the care plan. Hospital discharge instructions, if present, were not comprehensive, and hospital discharge summaries were typically not available to SHHCP at the time of the SOC visit. There was also information underload on the part of the older adult and informal caregiver, as they may not have had previous experience with receiving home care services, and hospital staff may not have clarified what to expect from SHHC services. During the visit itself, the older adult and informal caregiver were the most accessible source of information. The most useful sources of

information for the plan of care were the hospital discharge instructions (as patients may not have remembered details of the hospital stay) and the home environment itself (where the SHHCP could directly observe process failures, mitigating strategies, and informal caregiver availability).

In the following quote, a key informant who was a SHHCP at Site 1, described the information underload she experienced when going to conduct an SOC visit and how some older adults were not appropriate to receive SHHC services.

> *(P4:141:145): "…we were sometimes seeing inappropriate homecare referrals [because of poor assessments of patient's needs by hospital staff]. … so now the information that we're getting in terms of case referrals sometimes is like five sentences, so you're really not getting a lot of information when you're going into the home. … Basically, you're going in there blind. You don't know even what [kind of diagnoses] you're seeing."*

Step 2: Manage expectations

Key IM components: Information gathering, information transmission, information verification

The SHHCP remained the main information manager during this IM activity. As the visit proceeded, the SHHCP began to clarify what the older adult could expect from home care services, what the older adult's preferences for care were, and how willing and able the informal caregiver was to participate in the implementation of the care plan. The primary mode of communication was face-to-face, though the SHHCP may have needed to call the informal caregiver later if they were not present during the SOC visit. *Information conflict* was the main challenge during this IM activity, as there was often (>80% of the time in our observations) mismatched expectations on the part of the older

adult and informal caregiver regarding what services the SHHC would provide and what role(s) informal caregivers needed to take on. Most often, the older adult and informal caregiver expected the SHHCP to provide more services (e.g., daily visits, assistance with housecleaning) than were possible under the scope of their insurance benefits. Direct conversation among the SHHCP, older adult, and informal caregiver was the most accessible and useful source of information during this IM activity.

A key informant who was a home care coordinator at Site 3 described a commonly mismatched expectation about SHHC services from older adults and informal caregivers.

> *(P234:68:69): "I think sometimes they think [the SHHCP is] going to come in and wash their dishes too, you know."*

An informal caregiver at site 3 described how SHHC services exceeded their expectations, as they did not know that they could receive occupational therapy in the home.

> *(P250:370:376): "[Interviewer]: "… now that you've had more experience with home care, … have there been any surprises in terms of things you were surprised that the homecare providers could or could not do?*
>
> *[Informal caregiver]: Maybe [the occupational therapist coming to the home] was the biggest surprise, because I [did not have previous experience with this with other family members] …, so we had not had anybody working with her upper body …, her hands and arms and mobility. … So that was surprising.*
>
> *[Interviewer]: You didn't know that that was something they could do?*
>
> *[Informal caregiver]: Yeah, I hadn't really thought about that."*

Step 3: Ensure safety

Key IM components: Information gathering, information verification, information updating

The information manager during this IM activity continued to be the SHHCP. An important component of the visit for the SHHCP was to ensure that the older adult was safe to be at home and that the care plan could be carried out with the available resources. As part of the safety assessment, the SHHCP evaluated the physical layout of the home, the health literacy of the older adult and informal caregiver, and the informal caregiver's willingness and availability to assist with implementation of the care plan (e.g., there is a safe plan for medication administration). The primary mode of communication was through face-to-face interactions and through review of existing records. There was potential for *information scatter* and *information underload*. Information scatter existed when the SHHCP was at the same time not only evaluating the home, but also assessing the cognitive and functional abilities of the older adult and informal caregiver. Information underload often existed because the first visit did not provide a comprehensive view of the home situation. Nonetheless, the most accurate and useful information came from an assessment of the home environment itself.

Step 4: Develop contingency plans and recovery scenarios

Key IM components: Information gathering, shared decision making, information updating

The SHHCP was the information manager during this final IM activity during the SOC visit. Towards the end of the visit, after much information had been gathered,

transmitted, and verified, the SHHCP turned to creating an initial care plan through shared decision making with the older adult and informal caregiver. Then the SHHCP assisted with creating contingency plans and recovery scenarios for problems that may arise, such as the development of new clinical symptoms, running out of medications, or the sudden unavailability of an informal caregiver. The primary mode of communication was face-to-face discussion, supported by notes on paper or information from the EMR. Older adults and informal caregivers often felt *information overload* during the SOC visit, feeling overwhelmed with educational materials and tasks they needed to complete as part of the care plan. See Plate 2 for a photograph we took during a home care visit of a strategy an informal caregiver used to help his legally blind father keep track of tasks. Contingency planning, though intended to reduce anxiety, might have actually increased anxiety in the short term, as older adults and informal caregivers were asked to consider "worst-case scenarios" and plan for events they may not have considered could happen (e.g., house fire, shortness of breath, cardiac arrest). There was no one source of information during this IM activity that was accessible, accurate, and useful at the same time. In particular, physicians were often not accessible to assist with this IM activity, because the primary care provider may have been unaware of the older adults' hospitalization, and the hospital-based provider might no longer have been easily reachable or felt responsible for the patient after hospital discharge.

The following is an excerpt from researcher (AIA) observation notes of a SOC visit at Site 2. The SHHCP was developing a contingency plan and recovery scenario for an older adult recently hospitalized for falls. The referral documents characterized the hospitalization as related to the older adult taking her anti-epileptic medications

inappropriately. During the visit, older adult was anxious about falling again, especially because she lived alone.

> *(P204:8:17): "Patient is scared, nervous, and anxious. More so than what RN is used to seeing [based on prior visits]. [Patient] came out of hospital yesterday. … She is tearful and scared to leave house. Crying at the loss of her independence. Scared of a seizure. Still worried about falls.*
>
> *[Patient requesting a home health aide] … RN asking if family can stay with her also since aide cannot keep her from falling.*
>
> *…RN wants patient to enroll in Medicaid long-term care so she can have an aide even when she no longer needs home care and even when she is hospitalized. Right now she can only get aide while getting [SHHC services].*
>
> *…Seeing how scared she is; the RN also recommends a Lifeline [(falls alert system)] for her so if she has a seizure she can have assistance. Explains to her that she will need to leave [an apartment] key with a friend so [EMS doesn't have to] break down the door if they need to come in and she can't get to the door to let them in. Patient says she'll speak with a friend about this."*

Summary of IM-related process failures and information quality during the initial home care visit

We present three examples further detailing the concepts presented in the previous sections. The following is a quote from an interview with a SHHCP at site 2 who had just completed a SOC visit we observed with an older adult recently discharged from the hospital. Items in boldface type represent key IM activities or components. Underlined items represent IM-related process failures.

> *(P110:4:82): "[Interviewer]: And were there any unusual circumstances that you encountered here today? Or challenges for this particular transition? [SHHCP]: Yeah … I think that she was led to believe that she was going to be receiving services that she doesn't qualify for because of her insurance … and then … it's very important for us* ***to make sure that they are aware of all of their medications*** *[steps 2 and 3] and it becomes a barrier when they don't have their medication list. … Because they may have missed some information in between. So, but* ***I was able to call her doctor's office*** *[steps 3 and 4] and they* ***verified all***

her medications *[steps 3 and 4] with me, but sometimes I think, you know, that, that could be a problem.*

*[Interviewer]: In this particular case, it sounds like <u>they accidently threw out the discharge paperwork</u>. [SHHCP]: They did, but what was really good about it was that they actually reviewed the list before they discarded it. [Interviewer]: It sounds **like you rely on the discharge paperwork** [steps 1 and 4] quite a bit. [SHHCP]: I do.*

*[Interviewer]: Do you not get [any information] directly from the hospital? [SHHCP] So there is a [home care coordinator] who does the initial evaluation and referral, but sometimes … <u>not all the information is entered into our system or into our database.</u> So **we always rely on the hard copy** [of the hospital discharge instructions] [steps 1 and 4]."*

This SHHCP at site 1 described challenges faced after performing a SOC visit with an older adult. Information underload and erroneous information were key challenges.

*(P14:17:75): "frequently …, some of the information that we get on the referrals is <u>incomplete</u>, we sometimes get information that according to the patient is <u>completely wrong</u>. … And if <u>they don't have the discharge papers</u>, it's difficult to kind of **verify** and again, **we go back to … the doctor in the hospital** [steps 1 and 4], … and once they leave the floor and with the HIPAA, … it's very good because it protects the patient, but it makes it difficult for us because [the hospital] <u>can't give us information</u>. … [I had] two patients in the hospital, I **called the hospital to verify [information]** [steps 1 and 4] … <u>And sometimes they don't even want to give me [information] because [of] HIPAA</u>."*

The following is an excerpt from the field notes of one of the researchers (AIA) observing an SOC visit at site 2. The older adult's informal caregiver was dealing with information overload after the older adult's hospital discharge.

(P195:19:14): "Husband says he keeps all the hospital records. … Husband has binder given to him by [discharging hospital] with a full summary of the rehab hospitalization, labs, scripts, etc. … Binder has patient educational materials on all of the meds. [Binder also] has PT, OT, and RN assessments. RN very surprised to see this level of information. … I ask if she would like the

hospital RN assessments. She says 'not really.' Says the RN assessments of patient's function are old and not useful for today's visit, as she ***needs to do an assessment in the home in real time*** *[steps 1 and 3]. … Husband says [discharge] binder is overwhelming --he hasn't had time to read it--but he still thinks it's helpful to have. However, he is rifling thru all the papers to try and find something in the binder that he can't find about the meds. Spends a long time on this."*

In summary, the initial home care visit was characterized by having one main information manager—the SHHCP. The SHHCP also was a key information target, meaning that the SHHCP was gathering information for themselves to use in the future. Serving as both the information manager and the information target facilitated IM, allowing for complete tailoring of the information to the intended target; presumably, the SHHCP obtained the information that was most relevant to them. It is important to note that older adults and caregivers were also information managers. The work of older adults and caregivers will be the focus of additional analyses and future studies beyond the scope of this dissertation.

Additionally, the SHHCP managed information to and from the same audience, meaning older adults and informal caregivers served as both the sources and targets of information. For example, the SHHCP managed expectations by first eliciting expectations and preferences from the older adult and informal caregiver (serving as the information source). The SHHCP then clarified the role of home care for the older adult and informal caregiver (serving as the information target).

The SHHC referral was the key source of information to help the SHHCP prepare for the visit. Once the SHHCP was at the home, the home environment itself (e.g., physical layout, family dynamics) became the most accessible, accurate, and useful

source of information for assessing appropriateness and ensuring safety. Older adults, informal caregivers, and SHHCP often had mismatched expectations regarding what to expect from SHHC services. During the visit, SHHCPs spent a significant part of time in conversation dedicated to managing these expectations. There was no one source of information that was accessible, accurate, and useful at the same time for contingency planning and development of recovery scenarios. Notably, physicians were not easily accessible to assist with development of the care plan. We again refer the reader to Table 5 for a summary of the information manager(s), IM-related process failure(s), and information quality for the SOC visit.

Important characteristics common to both phases of the transition

We identified some characteristics common to both the SHHC admissions process and the SOC visit. First, though Figures 2 and 3 list each IM activity as occurring sequentially, the process was not always linear. There were examples of overlap among roles. For instance, coordinators and coordinator assistants shared tasks during the SHHC admissions process as they prepared the referral and informed the SHHC agency. There were also examples of overlap among tasks. During the SOC visit, the SHHCP might simultaneously be assessing an older adult's appropriateness for home care, and ensuring their safety.

Second, there was some variation across sites regarding who managed information for a particular IM activity. Some sites did not have coordinators preparing the initial referral to home care. In those cases, the hospital case management staff performed this activity. Additionally, some referrals took place after the older adult's discharge from the hospital, thus precluding the ability of the coordinator to meet the

older adult when they were in the hospital. SHHCPs admitting older adults from hospitals that had coordinators said they generally received higher quality information on the referrals. SHHCPs also trusted the information more, since the information came from "one of us," as opposed to a hospital case manager who may not understand what it was like to be a SHHCP and thus not understand SHHCP information needs.

Third, several information-related process failures could be present during each IM activity, and in some cases, process failures identified during one IM activity might be propagated to later activities. For example, an erroneous medication list sent to the SHHC agency could lead to information conflict during the SOC visit when the SHHCP was attempting to reconcile medications. During the SOC visit, information scatter when the SHHCP was assessing appropriateness for home care could lead to inadequate information gathering and result in missing information when preparing contingency plans.

Discussion

Older adults undergoing hospital/SHHC transitions are at high risk for suboptimal outcomes,[17] and our understanding of these transitions is incomplete.[40,108] Models to improve transitional care emphasize information sharing as a critical component of optimal care transitions.[57,180] Developing an in-depth understanding of IM during hospital/SHHC transitions can elicit contextual factors influencing the quality of care delivered during this particularly high-risk transition. SHHC IM needs are important to understand and address, because of SHHCPs' critical role in the post-discharge period,[181] and because of the particularly high risk of adverse events during hospital/SHHC transitions.[17]

This is the first study to identify key components of IM from the perspectives of older adults, informal caregivers, and SHHC professionals during older adults' hospital/SHHC transitions at multiple sites across the US. This is also the first study to use a HFE approach and apply the Information Chaos framework to identify IM-related process failures during older adults' hospital/SHHC transitions. Suboptimal IM can create challenges for SHHCPs when developing and implementing care plans for older adults, and study findings have implications for SHHCP work performance and for improving older adults' hospital/SHHC transitions. Study findings also demonstrate the usefulness of applying HFE methods systematically to understand safety risks in complex systems.

Key insights from study findings

This study provided important insights regarding IM during hospital/SHHC transitions. First, IM was complex and involved coordinating information from multiple sources across settings and over time. Because of this complexity, IM required a high reliance on many information sources, managers, and targets to reduce risk throughout the care transition. Despite this high reliance, the SHHC agency had little control over the accessibility, accuracy, and usefulness of information from sources outside of the agency (e.g., physicians, older adults, informal caregivers). Hence, suboptimal IM carried a significant risk of propagating IM-related process failures, unless there were systems to recognize and mitigate these process failures.

Second, organizational and technological infrastructure was not in place at the level of the hospital or SHHC agency to support IM during the hospital/SHHC transition. Our finding of the presence of information underload, scatter, and conflict suggests

SHHC staff needed integrated summaries of information in centralized locations to perform their tasks efficiently. Health information technology systems were poorly designed to support the "realities" of SHHCP work over time and across healthcare settings. The referral document was an attempt to provide succinct information tailored to the needs of the SHHC agency. SHHC agencies valued the information in the referral document so much that some agencies were willing to spend money to hire coordinators to be in charge of assessing potential patients and preparing the referral. We found that coordinators employed by SHHC agencies transmitted information that SHHCP felt was of higher quality and likely reduced the risk of IM-related process failures. Nonetheless, the fact that SHHC agencies expended significant energy to create tailored information summaries suggests that the infrastructure to create these summaries was otherwise lacking.

Third, we found variation across sites regarding who served as the information manager during the SHHC admissions process. When a home care coordinator initiated the care transition from the hospital, not only did SHHCP note improved information quality, but team members also trusted this information more; Because the SHHC agency employed home care coordinators rather than the hospital, information from home care coordinators represented a collaboration among team members, as opposed to information provided by an "outsider." Home care coordinators were also more sensitive to the information needs of SHHCP, many having previously worked in the home themselves. This finding highlights the importance of aligning information managers' perceived or actual incentives for completing IM tasks. Study findings also support

designing interventions to bring hospital and SHHC staff together to understand each other's work environments and information needs.

Fourth, and quite strikingly, physicians were notably absent from the hospital/SHHC transition. Despite coordinators' efforts to create accurate and useful referral documents, they had limited to no access to medical providers to clarify the plan of care. As a result, SHHC administrative staff scheduled SOC visits based on very limited clinical information. SHHCPs in turn often did not have access to complete and correct information during the SOC visit. In addition, neither hospital-based nor ambulatory care-based physicians were easily accessible to assist SHHCP, older adults, and informal caregivers with contingency planning and development of recovery scenarios. Efforts to improve care transitions need to address the underlying reasons for physicians' absence during the critical transition period, such as lack of awareness, accountability, or reimbursement.

Fifth, hospitals and SHHC agencies can leverage the home environment as an accurate and useful source of information. The home environment was important for assessing an older adult's safety and appropriateness for SHHC services, and much of the SOC visit was dedicated to gathering information about the home environment. Study findings suggest that assessment of the home environment, including family dynamics, earlier in the transitions process could be useful for screening out those who would not benefit from SHHC services. The SHHC coordinators had some role in performing this assessment, but pictures or videos of the home environment, observation of family dynamics, or even a home visit prior to discharge could greatly enhance their assessment.

Finally, though strategies to improve IM often include finding ways to provide access to more information, it is important to recognize the importance of information overload. Older adults and informal caregivers were especially susceptible to feeling overwhelmed when presented with information during and after hospital discharge. Cognitive impairment (e.g., delirium), fatigue, sleep deprivation, psychological distress, and the effort of the sheer number of tasks they needed to complete after discharge may have compounded the overload. Hence, providing more information and education may not be the most effective solution to empowering older adults and informal caregivers during transitions. Information needs to be parsimonious and tailored to the ability of the recipients to receive and process the information.

Study findings in the context of the literature

Study findings extend our previous work and that of others. Our previous work[40] demonstrated the complex workflow of home care coordinators and problems with information access as key challenges to optimal hospital/SHHC transitions. Study findings also extend our previous work[182-184] and those of others[111,181,185-187] identifying safety risks during hospital/SHHC transitions and support the need for further research to guide interventions to improve these high-risk transitions. Others have found a variety of unmet information needs in the home care setting post-discharge, including erroneous information and information overload.[181] A small study eliciting views of primary care physicians and SHHCP found that unclear definition of roles and responsibilities, care fragmentation, and miscommunication among community health providers may contribute to readmission.[185] Outside of the SHHC setting, information-related process failures were also prevalent during handoffs between community pharmacists.[169]

For SHHCPs, older adults, and informal caregivers, the information-related process failures could contribute to impaired situation awareness (i.e., a person's understanding of the current state of the situation) and increased mental workload (i.e., increased cognitive resources required for a task).[56] By affecting these outcomes, process failures can directly impair decision making during transitions. For example, SHHCPs may involuntarily consider fewer options when creating care plans, because they are working with limited information. As another example, older adults and informal caregivers feeling information overload after discharge may focus on a few elements of the care plan, such as taking only some of their medications, because they cannot handle all the tasks.

Limitations

This study should be considered in the context of several limitations. First, though it focused on the experiences of participants at five study sites nationwide, findings may not reflect the experiences of SHHCP, older adults, or informal caregivers elsewhere. We did choose study sites that varied as to the type of population they serve (rural/urban), ownership structure (for-profit vs. non-profit), and affiliation with academic institutions (yes/no). As this was a qualitative study, the focus was not on generalizability, but rather on transferability; The information-related process failures identified would likely resonate with similar stakeholders in other settings. Second, this study examined the work of SHHCPs, older adults, and informal caregivers. We did not study physicians, primarily because physicians have limited direct involvement in the execution of hospital/SHHC transitions. Additionally, we sought to highlight the voice of SHHCPs. The medical literature focuses mostly on physician perspectives and does not

generally represent SHHCP perspectives.[170,183,184] Third, this study focused on the SHHC admissions process and SOC visit, thus study findings do not reflect IM components nor information-related process failures present during other phases of the care transition (e.g., hospital discharge, time after the SOC visit).

Strengths

Despite these limitations, our study had several strengths. First, we chose to focus on the most high-risk care transition, the hospital/SHHC transition. Much of the work to improve care transitions focuses disproportionately on improving the process of hospital discharge (the "senders"),[108] and this study began to investigate the needs of the "receivers," in this case, SHHCP, older adults, and informal caregivers *after* hospital discharge. Second, we used HFE methods to identify threats to older adult safety during hospital/SHHC transitions. We have described elsewhere how HFE methods, though not frequently used, are particularly well-suited to evaluate contextual factors and develop an understanding of interactions among stakeholders within and across care settings.[109] Third, we obtained the perspectives of those most directly involved in hospital/SHHC transitions in order to have a comprehensive view and to give voice to those not well represented in the medical literature. Fourth, the credibility of our research findings rested in several practices commonly used in qualitative approaches: [188,189] prolonged engagement in the field; member checking of findings with participants; and triangulation of methods (e.g., observations, interviews).

Implications, future directions, and conclusions

Study findings have important implications for improvement of care transitions. Understanding the nature of information-related process failures can guide the

development of interventions to support IM during transitions. For example, interventions could promote standardization of information transfer protocols to reduce information scatter and support situation awareness.[190] SHHC/hospital team meetings could reduce the occurrence of information conflict, underload, and erroneous information. Team meetings have been tried and found useful in other healthcare settings[190,191] and could be modified to include hospital and SHHC staff. Additionally, the use of dashboards has been useful to capture, synthesize, and disseminate information on suboptimal transitions in real time.[192,193] Finally, programs designed to help SHHC and hospital teams get to know each other as "senders and receivers,"[183,194] may create behavioral incentives to improve IM. Future studies could examine barriers leading to information-related process failures, patterns of barrier propagation, outcomes resulting from suboptimal IM, and ideas for design implications to support IM during care transitions.

Table 4: Characteristics of participating study sites

SHHC Agency Site	Ownership	Region	Average daily census	Average monthly admissions	Number of transitions observed
1	Not-for-profit	Urban	1,977	1,280	13
2	Not-for-profit	Urban	3,229	2,152	11
3	For-profit	Rural	98	28	8
4	For-profit	Urban/suburban	170	51	6
5	Not-for-profit	Urban/suburban	750	550	22

SHHC: skilled home health care

Table 5: Summary of information managers, IM-related process failures, and information quality during the admissions process and initial home care visit

Phase	Step	Information manager(s)*	IM-related process failure(s)	Information quality
SHHC admissions process	Prepare referral and inform agency	Coordinator Coordinator assistant	Information scatter Information conflict	Face-to-face interactions (e.g., attending multi-disciplinary rounds) provide the most useful information
	Verify insurance	Administrative staff	Information scatter Information conflict	SHHC referral document is the most accessible and useful, if not always accurate, source of information
	Contact older adult	Administrative staff	Information underload Information conflict	Older adults and informal caregivers may not be easily accessible sources of information or have matching expectations for receiving SHHC services
	Review case and schedule visit	Administrative staff Team manager	Information underload	Visits are scheduled based on very limited information about the plan of care
Initial home care visit (SOC visit)	Assess appropriateness and obtain consent for treatment	SHHCP	Information underload Information scatter Information conflict Erroneous information	While useful, hospital discharge paperwork is often not easily accessible or comprehensive. Older adults and informal caregivers are accessible but not often aware of details of the care plan. The most useful source of information is the home environment itself.

Phase	Step	Information manager(s)*	IM-related process failure(s)	Information quality
	Manage expectations	SHHCP	Information conflict	Expectations for SHHC services among older adults, SHHCP, and medical providers are often mismatched, and direct conversation is needed to manage expectations on all sides
	Ensure safety	SHHCP	Information underload Information scatter	Observation of family dynamics and evaluation of the home environment are the most accurate and useful sources of information
	Develop contingency plans and recovery scenarios	SHHCP	Information overload	There is no one source of information that is accessible, accurate, and useful at the same time Physicians are not easily accessible to assist

*all are employees of the SHHC agency

IM: information management

SHHC: skilled home health care; SHHCP: skilled home healthcare provider; SOC: start of care

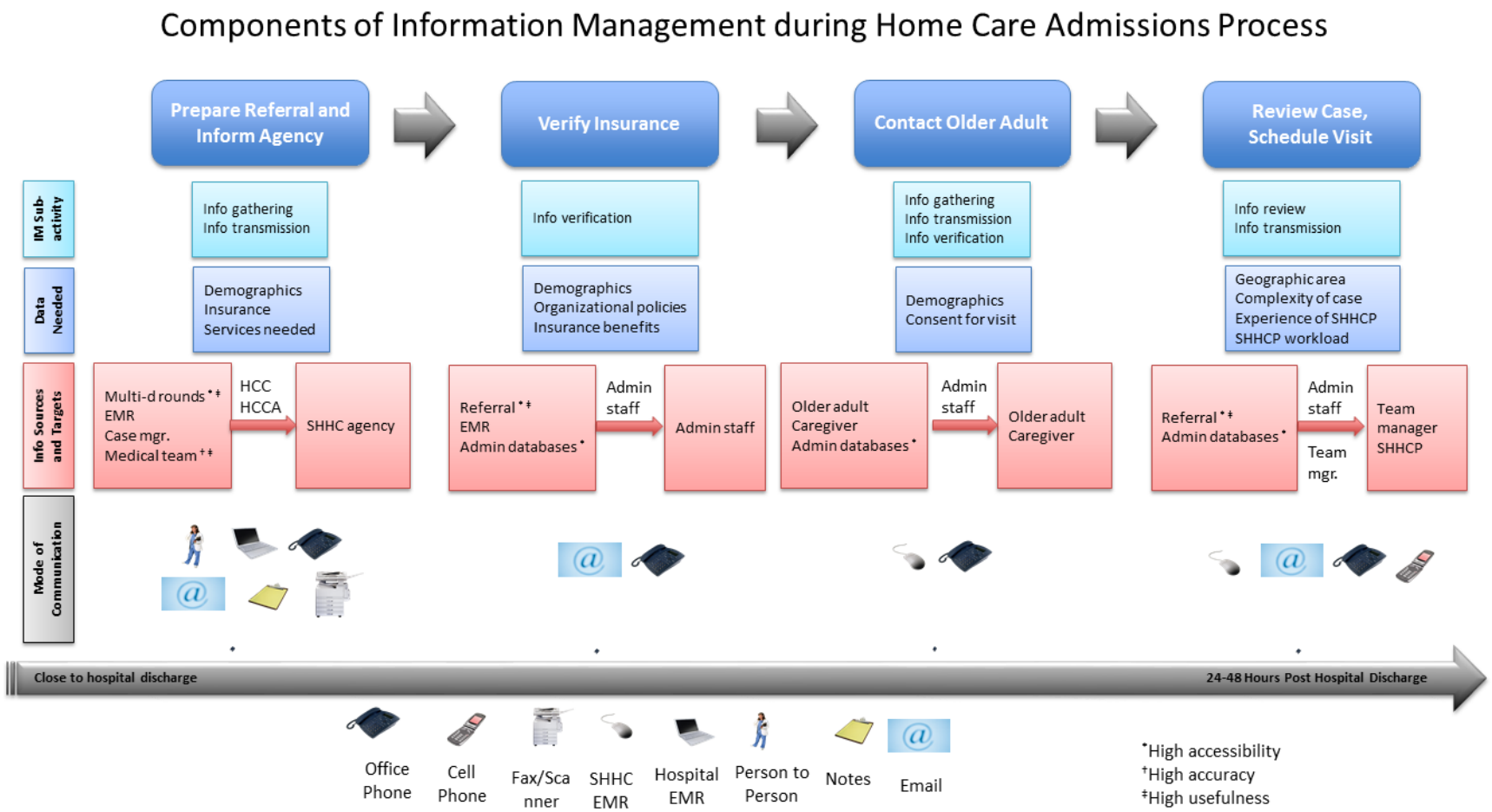


Figure 2: Components of information management during the home care admissions process

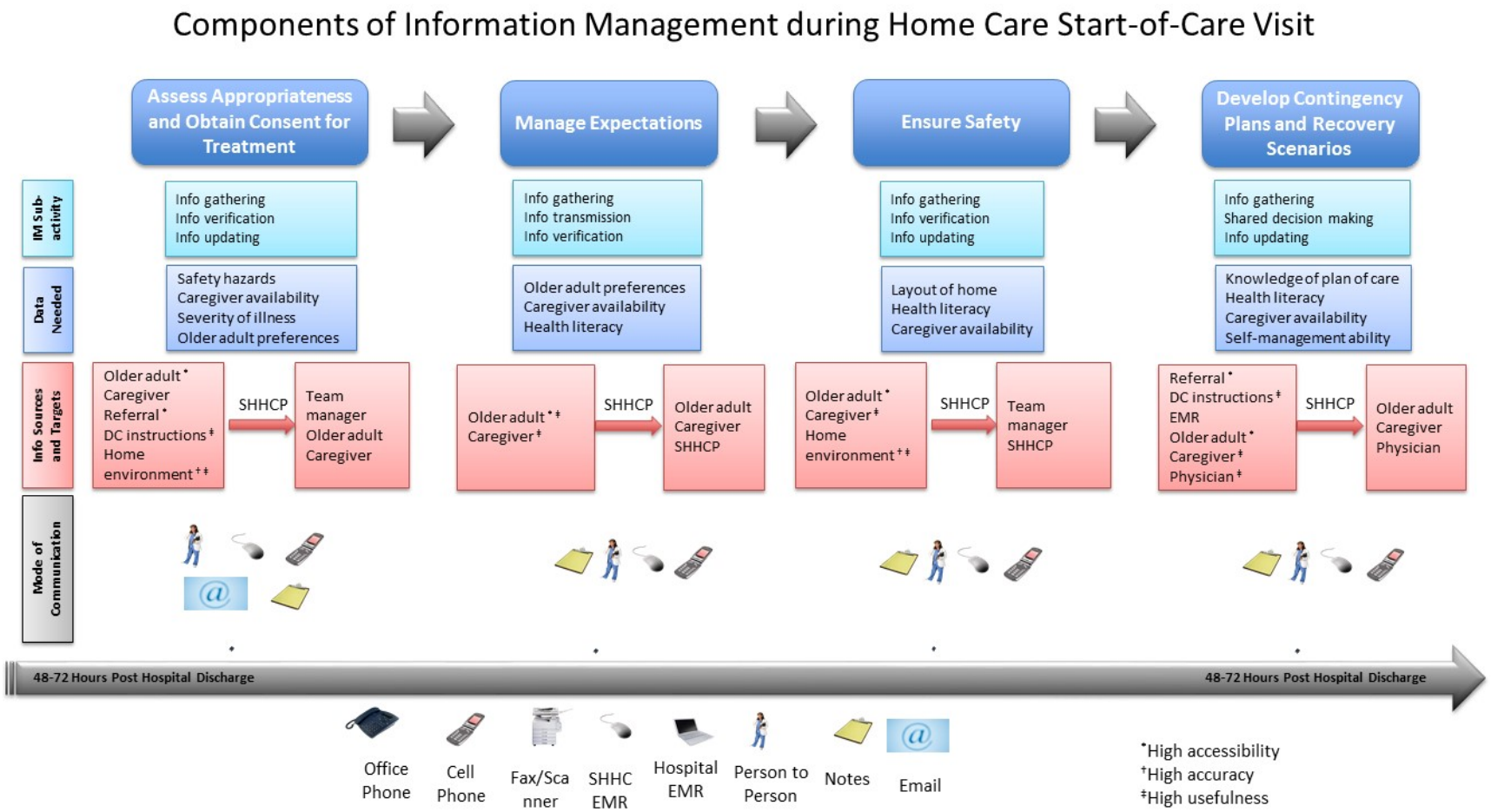


Figure 3: Components of information management during the home care start-of-care visit

Plate 1: Photographs of older adults' medications on the bathroom counter and in drawers

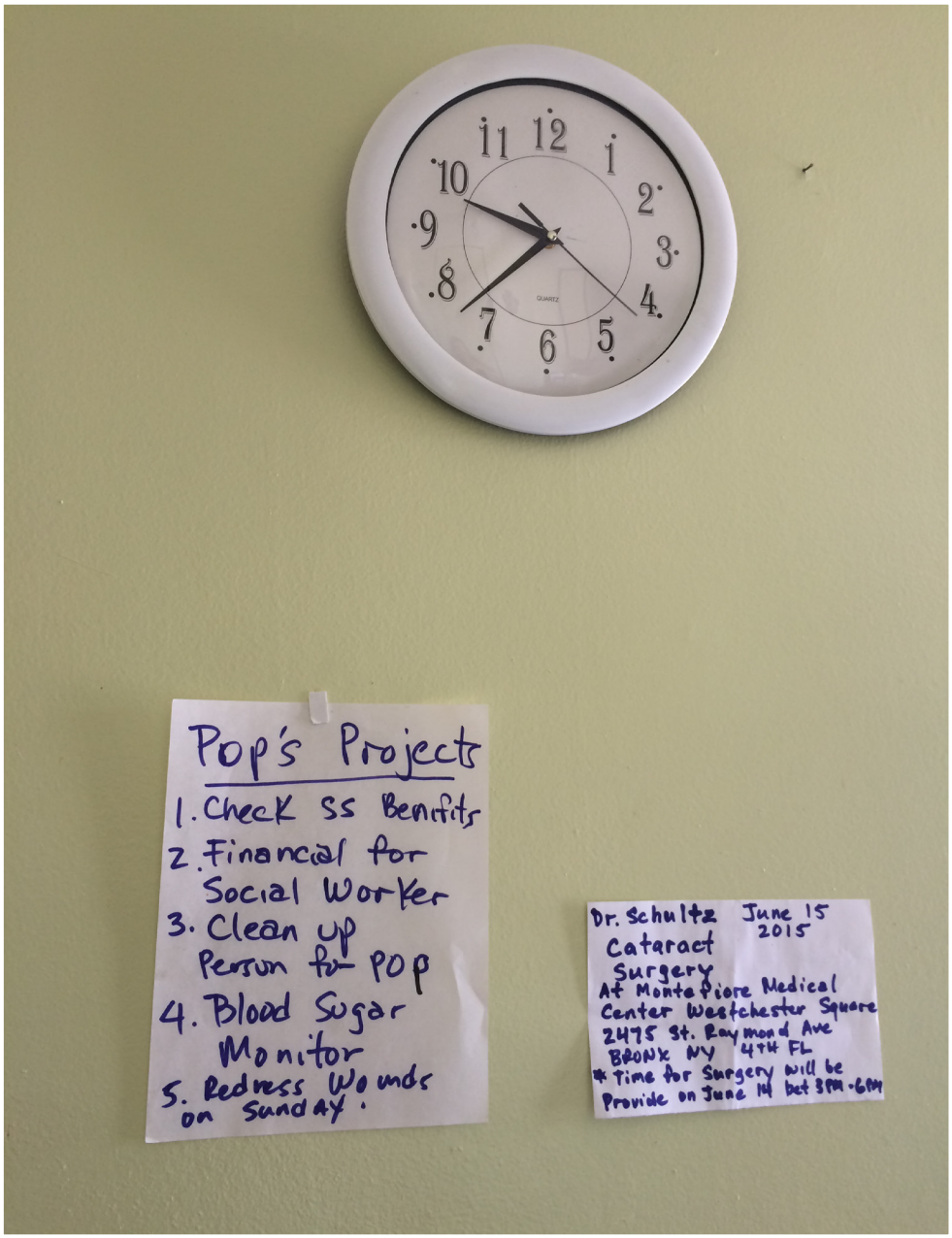


Plate 2: Photograph of flyers an informal caregiver created for his legally blind father to keep track of tasks and important events

Chapter 3. Information management-related process failures during home visits of older adults receiving skilled home healthcare services after hospital discharge: Analysis of risk factors and outcomes

Abstract

Background: Older adults who require skilled home health care (SHHC) services following hospital discharge are among those at highest risk of experiencing suboptimal outcomes during care transitions. Information management (IM) refers to the ability of skilled home healthcare providers (SHHCPs) to collect, organize, and communicate older adults' care plans to key stakeholders. Optimal IM is critical to ensure patient safety during a care transition from hospital to home, yet little is known about risk factors for process failures, and outcomes during this care transition, especially during the initial start-of-care (SOC) home visit after hospital discharge. Human factors engineering (HFE), a systems science that investigates factors affecting human performance, may be useful to understand risks and outcomes experienced by older adults receiving SHHC services after hospital discharge.

Objectives: We used a HFE approach to: 1) identify risk factors for IM-related process failures during SOC visits of older adults; 2) characterize older adult, SHHCP, and organizational outcomes of IM-related process failures; and 3) discuss strategies SHHCPs use to obtain needed information.

Methods: This was a qualitative study primarily guided by the HFE-informed Systems Engineering Initiative for Patient Safety (SEIPS) and Information Chaos frameworks, which identify IM-related process failures that contribute to suboptimal IM. We

interviewed 33 SHHC administrative staff to obtain contextual information about the SHHC admissions process (~end of hospitalization-24 hours after hospital discharge) and initial home visit (~48-72 hours after hospital discharge). We directly observed interactions among SHHCPs, older adults, and informal caregivers during the initial home visit after hospital discharge (n=60 visits). Following each visit, we interviewed the older adults (n=60), informal caregivers (n=40), and SHHCPs (n=46) involved. Participants were admitted to SHHC at five sites associated with three SHHC agencies in rural and urban sites across the US. Both field notes and audiotapes of interviews were transcribed, coded, and analyzed to generate themes and subthemes.

Results: We identified 278 risk factors for IM-related process failures during older adults' SOC visits after hospital discharge. We categorized these risk factors into each of the six SEIPS elements as follows: external environment (n=25); internal environment (n=21), organizational (n=59); person (n=88); tasks (n=55); tools/technology (n=30). We describe the most frequent risk factors contributing to IM-related process failures affecting older adults, informal caregivers, and SHHCPs during the SOC visit. We identified 34 outcomes resulting from these IM-related process failures, and we present pathways describing risk factors → IM-related process failures → outcomes. We also identified three key strategies SHHCPs used to obtain needed information when facing IM-related process failures: using the older adult or informal caregiver as a messenger; using alternative methods to access information, or seeking additional sources of information; and drawing on special relationships or connections with others.

Conclusions: Risk factors in the external environment and in the organization considerably affect the risk of IM-related process failures during the SOC visit. IM-

related process failures are associated with wide-ranging outcomes that can affect older adults' health, SHHCP morale, and organizational efficiency. Study findings suggest that efforts to improve IM during the SOC visit need to be multi-faceted, targeting risk factors within the entire work system. Study findings also have implications for the design of tools and technologies to ensure situation awareness and support IM during care transitions.

Key Words: transitional care, home care services, human factors engineering, qualitative research, frail elderly, information management, home care agencies, patient safety

Introduction

Care transitions remain suboptimal

Problems during care transitions of older adults are common, costly, and sometimes lead to adverse events.[4,9,108] After two decades of research focused on reducing such problems, unfavorable outcomes persist. Readmissions rates remain high, and older adults are often dissatisfied with the quality of their care.[16,18,163]

Older adults who require skilled home health care (SHHC) services following hospital discharge are among those at highest risk of experiencing suboptimal outcomes during care transitions.[17,25,164] SHHC are services provided by healthcare professionals (e.g., nurses, physical therapists) in a residential environment. Hospital readmission rates from the SHHC setting are approximately 25%, with most occurring within 2 to 4 weeks after hospital discharge.[165,166] Although interventions exist to improve care transitions from hospital to home,[63,85,159,160,167] given that re-hospitalization rates from SHHC settings remain high, [29,164] interventions that account for the complexity of the hospital to SHHC transitions are still needed.

The important role of the initial home visit

Interventions to improve transitional care and reduce unplanned healthcare utilization have generally focused on improvements to hospital-based processes (e.g., medication reconciliation, discharge planning, arranging follow-up appointments). However, many patient safety issues associated with unplanned healthcare utilization occur after hospital discharge,[19] and less is known about factors in the SHHC agency and home environment contributing to safety risks.

The first SHHC home visit is known as the "start-of-care" (SOC) visit, and it occurs approximately 48-72 hours after hospital discharge. There are unique challenges during this time frame that are deserving of further study. Skilled home healthcare providers (SHHCPs) performing this visit commonly have difficulties obtaining the information they need to develop care plans, since hospital-based medical team members are not easily accessible nor accountable, and SHHCPs are often practicing "between medical record systems."[37-40] SHHCPs spend time providing education to older adults and informal caregivers with the goal of eventual transfer of responsibility and authority to them to implement the care plan. Older adults and informal caregivers may not be adequately prepared to implement the care plan at the time of hospital discharge, as they may be overwhelmed with information and not have the adequate support systems to process this information.[32-34]

Information-management related process failures during older adults' care transitions from hospital to home

Information management (IM) is an important component in managing care transitions. IM refers to the ability of SHHCPs to collect, organize, and communicate

older adults' care plans to key stakeholders (e.g., other SHHCP, medical providers, older adults, informal caregivers) during the care transition. IM-related process failures are information problems that may contribute to errors[56] that occur when IM fails to achieve its intended outcome during transitions. In prior work,[195] we used an approach informed by the field of human factors engineering to identify IM-related process failures during care transitions of older adults receiving SHHC after hospital discharge, henceforth referred to as "hospital/SHHC transitions." We describe these process failures below.

To build on our previous characterization of IM-related process failures, it is important to understand risk factors associated with these process failures and the outcomes resulting from them. Moreover, it is critical to understand the strategies SHHCPs develop to cope with process failures, as these may further inform eventual targets for intervention.

Human factors engineering approach to care transitions

Input from disciplines within safety science can strengthen care transitions improvement efforts. Current interventions to improve care transitions target specific patient populations (e.g., those with congestive heart failure), specific settings (e.g., hospital unit, skilled nursing facility), or specific processes (e.g., medication reconciliation, discharge planning). These interventions, while useful, do not employ a broader systems approach that includes examining healthcare provider and patient incentives shaping behavior and performance. Other approaches are needed to complement and enhance existing interventions.

Human factors engineering (HFE) is a scientific discipline that uses qualitative and quantitative methods to proactively understand risks in complex systems by

evaluating the factors in a system that affect human performance.[109] HFE studies interactions among people (e.g., older adults, informal caregivers, healthcare providers) and elements of their *work system* (e.g., hospital unit, SHHC agency, older adult's home) to optimize performance and reduce harm.[21,102,107,168] Many, including the Institute of Medicine, have called for applications of HFE to evaluate care coordination, improve care transitions, and develop tools customized for home-based health care.[107-111]

Conceptual frameworks guiding this study

Systems Engineering Initiative for Patient Safety framework

The Systems Engineering Initiative for Patient Safety (SEIPS) 2.0[113] serves as the overarching conceptual framework for the current study (see Appendix, Figure 13). SEIPS 2.0 is a HFE work system model that describes a structured work system of 6 elements: (1) *people* – e.g., SHHCP, older adults, informal caregivers, physicians (2) the *tasks* people perform; (3) the *tools and technology* available and needed to complete the tasks; (4) *organizational* factors shaping the work, such as staffing, policies, teamwork, coordination, communication; (5) factors related to the *physical environment* in which work is performed; and (6) features of the *external environment*, e.g., insurance regulations, cultural norms. These elements interact to constitute processes (e.g., IM) that produce outcomes (e.g., medication adherence, improved health, job satisfaction).[113-115]

Information Chaos framework

To understand the process of IM, we also incorporated a complementary conceptual framework (see Appendix, Figure 14). The Information Chaos framework[56] uses a HFE approach to categorize five information-related process failures (i.e., information problems that may contribute to errors) that comprise information chaos

(confusion and disorganization). These five process failures represent failures of the IM process: information overload, underload, scatter, conflict, and erroneous information. A team of HFE researchers and family practice physicians investigating process failures in primary care settings first conceptualized this framework. The authors argue these process failures increase the risk of information-related errors by contributing to impaired situational awareness and increased mental workload. Researchers have also used this framework to study handoffs between community pharmacists.[169] We used the Information Chaos framework to understand the hospital/SHHC transition, and we describe each information-related process failure in the subsequent paragraph.

Information overload during hospital/SHHC transitions occurs where there is so much information that the person (SHHCP, older adult, or informal caregiver) has difficulty identifying which piece of information is relevant (e.g., a medical record with too much detail). The person is unable to easily organize, synthesize, interpret, or act upon the information. *Information underload* occurs when information needed to perform the task is missing (e.g., key aspects of the medical history are missing). *Information scatter* is when the needed information is located in multiple places (e.g., medical record, administrative databases, older adult's home, physician's office). *Information conflict* exists when the person is unable to determine which pieces of conflicting information are correct (e.g., medication discrepancies). Finally, *erroneous information* refers to information that is wrong (e.g., incorrect address, incorrect medication dose).

Objectives of the study

In order to guide hospital/SHHC transition improvement efforts, the objectives of this paper are to: 1) identify risk factors for IM-related process failures during SOC visits of older adults; 2) characterize older adult, SHHCP, and organizational outcomes of IM-related process failures; and 3) discuss strategies SHHCPs use to obtain needed information.

Methods

Design

This was a qualitative study. Using ethnographic methods, this design provided insight into work as it unfolded *in situ,* including the lived experiences and perceptions of participants in the specific context of their environment, an advantage for studying work across care settings.[170] This was part of a larger study of the hospital/SHHC transition, beginning from just prior to hospital discharge, extending through the first SHHC home visit (a.k.a. the "start-of-care" visit), and ending approximately 24 - 48 hours after the start-of-care (SOC) visit (Appendix, Figure 12). For this paper, we report on the subset of the data specifically informing the SOC visit (~48-72 hours after hospital discharge).

Following the recommended approach to data collection for qualitative research, we used multiple methods.[171] We first conducted direct observations and contextual inquiry[172] of the SOC visit, during which researchers directly observed work being performed and asked probing questions (e.g., to clarify or to gain a more in-depth understanding of what was observed and the motivation underlying people's work or decision making). Next, we conducted semi-structured interviews with older adults, in combination with their associated informal caregiver(s) (defined as any non-paid

individual that participated regularly in the care of the older adult). We conducted separate interviews with the SHHCP assigned to provide care in the home, the hospital-based SHHCP who initiated older adults' transitions from the hospital, and SHHC administrators and staff involved in transitions. The SEIPS and Information Chaos frameworks guided interviews, which focused on key components, barriers, and facilitators to successful IM during care transitions (Appendix, Figures 13 and 14, and Tables 9-11). Interviews included probing questions on the following aspects of IM: sequence of tasks; how, where, and by whom tasks were performed; variations in the tasks, tools, and technologies used to perform tasks; and, strategies used to overcome observed or voiced challenges to task completion. Interviews lasted approximately 45 minutes and were audiotaped and transcribed. Field notes were also transcribed electronically to facilitate analysis.

Settings and Participants

Participants were admitted to SHHC at five sites associated with three SHHC agencies in rural and urban sites across the US. Sites 1 and 2 were part of a not-for-profit agency in a large metropolitan city. They provided care for racially, ethnically, and economically diverse communities with complex care needs. Sites 3 and 4 were part of a for-profit agency serving rural (Site 3) and urban/suburban (Site 4) communities. Site 5 was a not-for-profit agency affiliated with an academic medical center in a moderate-sized city. Table 6 summarizes key characteristics of each site and the number of transitions we observed at each site.

We used a combination of purposive and network sampling[173] to identify SHHC administrative staff involved in executing or overseeing hospital/SHHC transitions. We

interviewed 33 staff (intake staff, visit schedulers, clinical team managers, quality improvement officers, executive leadership) to obtain contextual information about the SHHC admissions process (~24 hours after hospital discharge) and initial home visit (~48-72 hours after hospital discharge).

We then identified English- or Spanish-speaking older adults ≥ 65 years of age referred for SHHC services after hospital discharge. The participating SHHC agency would inform us of new referrals. We approached older adults either in person before hospital discharge, or by phone the day after hospital discharge. All older adults referred to the participating SHHC agency were eligible for the study, regardless of diagnosis. We obtained consent from the SHHCP assigned to visit the older adult in the home, and the older adult (or the older adult's legally authorized representative, if applicable). We directly observed interactions among SHHCPs, older adults, and informal caregivers during the SOC visit after hospital discharge (n=60 visits). Following each visit, we interviewed the older adults (n=60), informal caregivers (n=40), and SHHCPs (n=46) involved. This study was approved by the Johns Hopkins School of Medicine Institutional Review Board and the review boards at participating sites.

Approach

The data we analyzed for this paper was comprised of over 180 hours of observation (60 homecare visits lasting ~3 hours each) and ~80 hours of interviews of older adults, informal caregivers, SHHCPs, and SHHC administrators. To characterize the flow of information, we used HFE methodology employed in our previous work described elsewhere,[40] which involved analysis of field notes, grouping of observed tasks, creating process-flow diagrams, and reviewing diagrams with SHHC subject matter

experts. We applied both the principles of inductive reasoning, and our conceptual frameworks to guide data analysis and interpretation, an approach particularly useful for health services research.[174]

Both the SEIPS 2.0 and the Information Chaos frameworks guided directed content analysis. We used an iterative approach to create our coding framework and generate themes and subthemes.[175,176] Two researchers (AIA, AH) reviewed all transcripts and identified items regarding IM-related process failures. These became first-order codes consisting of terms, concepts, and categories originating from the participants themselves.[177] Four researchers (AIA, AH, APG, BL) combined these codes into second-order codes representing risk factors for, and outcomes of, IM-related process failures within the SEIPS 2.0 and Information Chaos frameworks. We coded portions of the transcripts under multiple categories, if appropriate. We continued to create codes inductively within each domain of the frameworks. Additionally, we used the following predetermined codes to facilitate data analysis: transition time period (SOC visit), participant type (older adult, informal caregiver, SHHCP, SHHC administrator). We also identified emergent codes, i.e., codes representing ideas not falling within the SEIPS 2.0 or Information Chaos frameworks, or our predetermined codes. All members of the research team discussed differences and reconciled these differences by consensus. ATLAS.ti qualitative data management software was used to facilitate analysis.[178] See Appendix, Table 12 for an overview of the analytical coding framework.

We used the "query tool" function in Atlas.ti to extract quotes coded with combinations of the dimensions of interest: IM-related process failures, risk factors by SEIPS element, outcomes, and SOC visit. For each outcome (e.g., adverse event, poor

communication, dissatisfaction), we examined the patterns of risk factors and IM-related process failures that preceded it. We documented our analyses by creating research memos for each query in Atlas.ti, a practice recommended by qualitative researchers.[179] We ran queries to identify patterns for all possible combinations of SEIPS element, IM-related process failure, and outcome. After completing that portion of the analysis, we used the same approach to investigate strategies used by SHHCP to handle IM-related process failures.

Results

Participant characteristics

The 60 older adults (68.3% female; 65.0% Caucasian, 15.0% African-American, 13.3% Hispanic, 1.7% Asian) had an average age of 73.8 years (range=48-98 years). The 40 informal caregivers (62.5% female; 32.5% Caucasian, 17.5% African-American, 5.0% Hispanic, 2.5% Asian) had an average age of 62.9 years (range=21-87 years). The 46 SHHCPs (93.5% female, 26.4% Caucasian, 23.9% African-American, 4.0% Hispanic, 4.4% Asian) had an average age of 43.5 (range=27-67), an average of 16.4 years of experience (range=3-31 years), and their average number of years practicing in the home care industry was 11.8 years (range=0.5-33 years). SHHCPs were 69.6% nurses, 19.6% rehabilitation therapists, and 8.6% administrators or SHHC coordinators. The 33 key informants (87.9% female, 69.7% Caucasian, 18.2% African-American, 3.0% Hispanic, 6.1% Asian) had an average age of 48.0 years, had an average of 22.5 years of experience (range=4-42 years), and their average years practicing in the home care industry was 16.5 years (range=2-35 years). See Appendix, Tables 13-16 for the complete demographics for each site and for the overall study.

Overview of presentation of risk factors, IM-related process failures, outcomes, and strategies to obtain needed information

We first describe the risk factors associated with IM-related process failures, organized by SEIPS element. In the subsequent section, we present the outcomes associated with each process failure, and we diagram common pathways leading from risk factor → process failure → outcome. Finally, we identify strategies used by SHHCP to obtain information when faced with IM-related process failures. We support and illustrate our findings by presenting representative quotes and examples from our data. To demonstrate that the concepts we present are representative of our data, we provide examples from a variety of participants and settings. Reflective of our triangulation efforts to capture different dimensions of the same phenomenon during data collection and analysis, we report data examples supported by participant reports and researcher observations.

Risk factors contributing to information-related process failures

We identified 278 risk factors for information-related process failures during older adults' SOC visits after hospital discharge (Appendix, Table 12). We categorized these risk factors into each of the five SEIPS elements as follows: external environment (n=25); internal environment (n=21), organizational (n=59); person (n=88); tasks (n=55); tools/technology (n=30). Table 7 lists each SEIPS element and the most frequent risk factors during the SOC visit (i.e., occurring ≥ 10 times in the dataset), along with descriptions and examples for each risk factor. The risk factor could affect older adults, informal caregivers, SHHCP, or all three. In our analyses, each risk factor listed contributed to the majority (at least 4 out of 5) of the information-related process failures.

In the following sub-sections, we briefly describe each SEIPS category and present illustrative quotes with examples of risk factors, highlighted in boldface type.

Risk factors related to the external environment

The external environment encompassed factors outside of the health system or SHHC agency that influenced IM, such as government regulations, cultural norms, neighborhood factors, and liability concerns. The following is an excerpt from the field notes of one of the researchers (AIA) observing a SOC visit at site 1. The nurse was using the Outcomes and Assessment Information Set (OASIS), a data collection tool used by SHHC agencies to collect and report performance data to the Centers for Medicare and Medicaid Services.[196] The use of this tool was mandatory, and as we can see in this case, the tool interrupted the natural flow of conversation and information gathering during a SOC visit.

> *(P153:29:36): "Then RN goes thru OASIS. She says some of the questions are repetitive and she will answer [them] based on the conversation they have already had. Describes the Oasis as a* ***'Government tool'*** *to determine services for patient … I note a lot of OASIS is up to interpretation, as the RN fills out based on her own assessment. Makes the conversation seem formal and without a flow.*
>
> *[RN now asks* ***OASIS-mandated questions*** *about depression, and patient becomes upset at possibly* ***being labeled as depressed****. RN has to now re-establish rapport, because] … the depression screening touched a nerve.*
>
> *I note that from the patient's perspective* ***these [OASIS] questions appear to be random****. Patient asks 'it doesn't matter if I've had one of these assessments before from [SHHC agency]?' RN says no. I gather [patient] is frustrated with all the questions and assessments."*

Risk factors related to the internal environment

The internal environment referred to the home environment, including the physical layout of the home and dynamics of family members within. The following is a quote from a key informant interview with a team manager at Site 1. The manager's role was to supervise a group of SHHCP and be a resource for issues that may arise. Here, the team manager described how the home environment affected information gathering during the SOC visit. Plate 3 shows a photograph we took during a home visit that represents some of the concepts described in this quote.

> *(P5:258:258) "I have senior nurses. They've all been here for a while. But, they will call [me for help], you're alone in these homes and* ***there's people, barking****, and you're on a computer, and you gotta get this information, and it's getting late, and you got two more visits, and it's so late, and you're trying to get this information, … and the* ***dog is going****, and* ***there's roaches****, and … there's* ***all this stuff****. … [They say], 'I don't know what to do, I don't know whether I should [admit this patient]'… And you can kind of help them figure it out pretty easily … because you're not there with all that* ***drama*** *going on..."*

Risk factors related to the organization

The organization referred to the SHHC agency, and factors included organizational policies, delineation of SHHCP roles, complexity of work, and communication breakdown. In this example, a SHHCP at Site 1 compared admissions done on the weekends versus the weekdays. Because of organizational protocols for staffing admissions and transmitting information on the weekends, the SHHCP found information might not always reach intended targets.

> *(P14:189:208): "[On the* ***weekends****] … at the end of your day you call the office and you give* ***[a limited] report to a business person [not a clinician] …*** *the rest of the information is supposed to be in the computer, [but] it's technology****, there's going to be pitfalls****. … There's stuff that's …* ***going to take days to download****. There are times that I see something that my manager doesn't see and*

*vice versa. … **During the week … your teammates [are available]** … and you can always call them. … **Whereas on the weekends it's not the same thing** … in an ideal world … [we would] … not have as many admissions … on the weekend."*

Risk factors related to the person

The person referred to characteristics of the older adult, informal caregiver, or SHHCP that affected IM. Risk factors include health literacy, health beliefs, and expectations regarding health care. The following quote was from a SHHCP at Site 1 who was describing how older adults gathered and processed information differently based on beliefs and expectations about their care.

*(P14:24:37): "And some patients and especially a **certain age group**, the geriatrics, **they tend to say 'the doctor told me to, so I did it.' And they don't really know [why they are supposed to do something]** and I think as a homecare provider, we want to try to change that. … They need to know what's happening to them and why it happened, not just **'because my doctor said so.'"***

Risk factors related to tasks

Older adults, informal caregivers, and SHHCP needed to complete many tasks after hospital discharge, including managing medications and communicating with physicians. The following was an excerpt from the field notes of one of the researchers (AIA) observing a SOC visit at site 4. The nurse and older adult were attempting to obtain missing information from the primary care provider about the treatment plan—in this case the use of anticoagulation. The task was complex, and no party had complete information. The nurse also faced additional challenges when technological issues arose, causing difficulty to obtain and document information.

*(P213:35:46): "Doctor's office calls patient during visit. Patient asks whether she should be taking blood thinners. **[Doctor's office staff unaware***

patient was hospitalized *and] is asking* ***what hospital she was at?*** *"Can you all access the records?" the patient asks. [Doctor's office places patient on hold].* ***RN takes notes while she is waiting for patient to get off phone. She is manually writing down the meds from the hospital records.***

Signature [function] didn't work on computer and patient needs to re-sign while on hold with doctor's office. They are still trying to clarify anticoagulant issue.

RN begins to prepare supplies to draw blood from patient. ***Draws it while patient on hold. Doctor's office says they are 'having trouble getting the chart up.'*** *Still on hold.* ***RN continues multi-tasking and takes vitals.*** *...*

Finally, doctor's office gets back on phone. Says to come in and be seen this week. Keep up with Coumadin. ***[I note that doctor's office still doesn't know why patient was placed on three anticoagulants].***

[RN now says] ... ***'Since my computer is dead, I need to think of all the questions to ask you. ...I think I've got everything [in my head].'*** *she says after a pause."*

Risk factors related to tools/technology

Tools and technology referred to devices or services used by older adults, informal caregivers, or SHHCP to support IM during the SOC visit. These included computers, Wi-Fi, cell phones, blood pressure cuffs, oxygen saturation monitors, and glucometers. See Plate 4 for photographs we took of SHHCPs using their laptop in the confines of a "mobile office."

In the example in the previous section, the SHHCP's computer crashed. Without the computer prompting her to ask the over 100 OASIS admission screening questions, she had to remember to ask them herself. In the following example, a SHHCP at Site 2 described challenges using a new computer system at the agency, impeding the reliable transfer of information.

(P107:138:148): "Yes, we have a new computer system which is ... just being

*piloted right now … **there's a learning curve** and **we have a lot of problems with connectivity** and so … **we're losing data sometimes**. Sometimes even with the older system …, **the system shuts down**."*

Older adult, SHHCP, and organizational outcomes resulting from information-related process failures

We identified 34 outcomes resulting from information-related process failures during older adults' SOC visits after hospital discharge (Appendix, Table 12). Outcomes affected the older adult/informal caregiver, SHHCP, the SHHC agency, or all three. Table 8 depicts each information-related process failure and the most frequent outcomes (i.e., occurring ≥ 10 times in the dataset) identified during the SOC visit because of that process failure. For example, the most common outcomes of information conflict were as follows: delays/inefficiencies; poor communication; plan of care not implemented; non-adherence to care plan; and situation awareness not present (i.e., everyone not being "on the same page"). By comparison, information overload more often led to not only delays/inefficiencies and poor communication, but also worsening health on the part of the older adult, and stress/fear/frustration for all involved. Information underload led to SHHCP workaround development, not seen as often because of other information-related process failures. Errors and adverse events related mostly to erroneous information, and non-adherence related mostly to information conflict.

In the subsequent sections, we present diagrams highlighting a few hypothesized pathways from risk factors → information-related process failures → outcomes, with accompanying representative quotes. We do not mean for these diagrams to provide a comprehensive list of the pathways in our data, but rather we mean to illustrate examples

of the ways in which risk factors could lead to outcomes during the SOC visit. In cases where the speaker describes a strategy to deal with the process failure, we present the strategy as well.

Information-related process failure: erroneous information, information underload, information conflict

The following is an excerpt from a key informant interview with a SHHCP at Site 1. Items in boldface type represent risk factors, process failures, outcomes, or strategies (pathway outlined in Figure 8, Scenario A). In this case, the SHHCP did not have the information needed to implement the plan of care, and she could not reach a physician for guidance. The SHHCP implemented a backup plan developed by the SHHC agency, but the older adult's wife did not implement it due to a misunderstanding which then led to information conflict. The SHHCP also developed a workaround to communicate with the physician; She asked the older adult's wife to serve as a messenger to the doctor to attempt to establish communication.

> *(P4:341:341): "The doctor's name that I was given in my referral* ***was not the doctor who's taking care of him****. … So, the [actual] doctor was making a house call there yesterday and I told the wife, I said,* ***please give him my phone number*** *…* ***I need wound care orders*** *… the only thing that we could do for wound care in absence of doctor's orders is we have a* ***protocol*** *which is to cleanse with soap and water, put a dry sterile dressing on it which I had* ***instructed the wife*** *about … [I saw the patient on Friday,] but that same dressing was on there Monday …*
>
> *I said [to the patient's wife], '****How come you didn't change this [dressing]?****' '****Well, you told me not to****.' 'I said, no… it was soap and water until we get the doctor's orders… But, remember, I told you in order for this to heal … it has to be clean and dry. And, not only do we have the same dirty dressing, … but he's still laying on soiled linens … he will be* ***back in the hospital with an infection*** *if he's not kept clean and dry and I have to report this to the doctor and* ***I don't have any doctor to report this to right now*** *…* ***please get his name and phone***

number' *... [This is] gonna be a ... very, very, very difficult case, and* ***that takes a lot of time****."*

Information-related process failure: information underload

The following is an excerpt from a key informant interview with a team manager at Site 1 supervising a group of SHHCPs. Items in boldface type represent risk factors, process failures, outcomes, or strategies (pathway outlined in Figure 9, Scenario B). The team manager described how an organizational policy put in place to standardize, and minimize, the information transferred from the hospital to the SHHC agency affected the SHHCP on the receiving end. The policy aimed to reduce the amount of free text narrative (referred to as "comments") that home care coordinators included in the referral from the hospital. Home care coordinators in the hospital used the comments section as a way to convey nuanced information about the patient. The SHHCP in this case was unprepared for the visit, in part because the referral did not contain complete information.

> *(P5:278:282): "We have this ...* ***[new organizational policy on standards for information transfer]****, which means* ***we get less information*** *in our [free text] comments on the patient. Some people send us more information than others, it* ***depends on the person*** *sending ...the referrals ... [for example, one of my] nurses walked in [to see a patient, she thought] ... he had hypertension ... [and the nurse asked him,] '****What is that bandage there for, what'd you have done?****' I mean, [the nurses]* ***look stupid****. They* ***feel stupid*** *because the* ***comments are not there*** *[on the referral], the* ***diagnosis is not there****, we don't know what procedure [the patient] had, and the patient ... thinks ..., 'How do you not know this? Did you talk to my doctor ...* ***didn't anybody tell you what happened****?'*

Information-related process failure: information overload

The following quote comes from an informal caregiver at Site 2 taking care of her husband who had just returned home from the hospital. Items in boldface type represent risk factors, process failures, outcomes, or strategies (pathway outlined in Figure 10,

Scenario C). She described feeling exhausted and not able to evaluate the large amount of information the hospital provided in a binder (see Plate 5 for a photograph we took of an example binder). Interestingly, her previously favorable experiences with the hospital, especially as a minority, shaped her strategy for dealing with information overload. She had trust in the hospital's care plan decisions and felt less pressured to review the information provided at discharge.

> *(P126:159:163): "… even though [the hospital] gave me the documentation, … I've been **too exhausted** … I haven't had the opportunity to … get my thoughts all together and then **clear my head**, … you see I got that **big binder** there? [refers to binder full of hospital discharge information] … Just to try to **evaluate and understand all the verbiage** and everything in there, could take you a long time. **I'm not a doctor**. There's **a lot of medical terms**, that I ought to research to understand … **I have faith in [the hospital]** … so **I feel more comfortable with … their decisions** … I've been through a lot … with that hospital. With all the kids and everything, being **Hispanics** and everything."*

Strategies SHHCPs used to obtain needed information

SHHCPs found themselves constantly affected by IM-related process failures, and they developed individually based strategies when faced with these process failures. We describe three key strategies SHHCPs used to obtain needed information in these situations.

Using the older adult or informal caregiver as a messenger

The older adult (and informal caregiver, if present) were the only common thread during hospital/SHHC transitions. That is, the older adult and informal caregiver were the only people with whom all other key team members were communicating. SHHCPs would ask the older adult or informal caregiver to gather, retrieve, or convey information that should have been already available. SHHCPs used this strategy in two main ways.

First, SHHCPs would invariably rely on the discharge paperwork given to the older adult as a key source of information during the SOC visit. When paperwork was not available (e.g., family had misplaced the paperwork), there was generally no other resource to provide the information—highlighting a structural risk factor—since the SHHCP did not usually receive discharge instructions or the discharge summary as part of the referral from the hospital. Second, as illustrated in an earlier example, SHHCP would "pass on messages" to physicians through older adults or informal caregivers, creating an opportunity for additional IM process failures to occur. They employed this strategy when they had difficulty identifying or communicating with a physician. Some SHHC agencies employed a "note passing" system, in which SHHCP gave older adults a note to give to the physician at the next visit. The SHHCP wrote on one side of the note any questions, observations, or concerns regarding the patient. The physician was to write on the other side of the note answers to the questions and any changes to the plan of care. This strategy only worked if the older adult remembered to bring the note, and if the physician remembered to complete it and return it to the older adult.

Using alternative methods to access information, or seeking additional sources of information

SHHCPs employed alternative methods to access needed information. For example, if the SHHCP was not hearing back from the physician after leaving a message, the SHHCP might begin calling the physician's office on a daily basis until receiving a response. Other SHHCPs showed up in person to physician's office to obtain information. SHHCPs sought additional information though the electronic medical record or search engines, such as Google, to obtain patient or physician contact information. Several used Google Translate when an interpreter was not available during

a SOC visit with a non-English speaking patient. Of note, SHHCPs asked one of the researchers to fill in as an interpreter on several occasions during the research study. When encountering a physician who was not willing to sign orders, an SHHCP might call another physician involved in the older adult's care (e.g., hospitalist, primary care provider, specialist) to step in.

Drawing on special relationships or connections with others

One of the most effective strategies for obtaining needed information was through drawing on special relationships or connections with others. SHHCPs would spend time building strong relationships with physician office staff, hospital case managers, hospital switchboard operators, and home care coordinators. These connections would prove invaluable when an SHHCP needed information quickly and needed to circumvent obstacles, such as having to explain their role and why they needed the information. Depending on how some interpreted HIPAA privacy rules, hospital staff would tell SHHCPs they could not receive information related to the older adults. By building relationships, SHHCPs became recognizable and familiar to hospital and clinic staff and had less difficulty establishing their need to obtain this information.

Discussion

Older adults undergoing hospital/SHHC transitions are at high risk for suboptimal outcomes when compared to those undergoing other transitions.[17] Because our understanding of hospital/SHHC transitions remains incomplete,[40,108] it becomes critical to elicit the perspectives of those directly involved in these transitions. Using a HFE-informed approach, we elicited contextual factors influencing the quality of care delivered to older adults during this particularly high-risk transition.

This is the first study to identify risk factors for IM-related process failures during older adults' SOC visits, categorize outcomes resulting from these process failures, and summarize strategies SHHCPs use to obtain needed information. We found many risk factors contributed to process failures, which then led to significant outcomes for older adults, informal caregivers, SHHCPs, and SHHC agencies. SHHCPs resorted to developing individually based strategies when faced with these situations. Study findings have implications for guiding efforts to support IM during older adults' hospital/SHHC transitions.

Key insights from study findings

There are important new insights from this study. First, risk factors in the external environment and in the organization considerably affected the risk of IM-related process failures during the SOC visit. The Centers for Medicare and Medicaid Services' mandate for the reporting of OASIS measures provides a good example. SHHCP spent a major portion of the SOC visit gathering information related to these measures; Older adults and informal caregivers may be asked over 100 questions from the OASIS alone during the approximately 3-hour SOC visit. Organizations have control over how to integrate these questions into the visit and in what order. At a time when SHHCPs are attempting to build rapport and trust with older adults and informal caregivers, these questions may seem intrusive to the older adult and may not be directly relevant to implementing the plan of care. Because of spending time on these questions, the workflow of the visit is affected and critical information may not be gathered.

Second, IM-related process failures were associated with wide-ranging outcomes that could affect older adults' health, SHHCP morale, and organizational efficiency.

Without adequate information, older adults may have unclear expectations about what they need to do to manage their health, negatively affecting their ability to adhere to the recommended care plan. Process failures also affected the SHHCP's ability to develop and implement a care plan tailored to the older adult's needs. Additionally, process failures led to added stress, fear, and frustration for SHHCPs, older adults, and informal caregivers alike. SHHC organizational efficiency was affected when SHHCPs experienced delays in obtaining needed information and spent valuable time devising strategies to work around system failures. SHHC agencies also had difficulties maintaining an adequate workforce, since it was challenging to recruit and retain SHHCP able to manage these process failures.

Third, we found that pathways from risk factor → process failure → outcome were multi-faceted. There were no predominant set of pathways; No one set of risk factors was a stronger driver of process failures than other risk factors. Instead, we found that risk factors from all of the six SEIPS elements led to each IM-related process failure. The same was true of the relationship among process failures and outcomes; Process failures led to outcomes at multiple levels (i.e., older adult/informal caregiver, SHHCP, SHHC agency), and no one process failure was a primary driver of outcomes. Thus, study findings suggest targeting improvement efforts to specific risk factors or process failures is unlikely to fully address outcomes of suboptimal IM nor significantly improve transitional care. Moreover, patterns of process failures differed from transition to transition, and across study sites. These differences did not occur in predictable ways, making it challenging to identify site-specific profiles of process failures without further in-depth analysis. Hence, study findings suggest that health systems and SHHC agencies

may need to engage in HFE-informed needs assessments to develop organization-specific approaches to improving hospital/SHHC transitions.

Fourth, a striking study finding was the extent to which SHHCPs developed individual strategies and workarounds to overcome challenges resulting from IM-related process failures. Known as "first-order problem solving," these ad hoc workarounds generally fail to address the system-level organizational origins of the risk factors to optimal care transitions.[197,198] In other words, individual strategies are often employed, even encouraged, to address process failures, but changes to organizational culture are needed to truly effect change. Especially troubling was SHHCPs' reliance on older adults and informal caregivers themselves to provide information that is the responsibility of the health system or SHHC agency to provide. Older adults and informal caregivers are not prepared or trained to serve as messengers of information, and post-hospital cognitive impairment may affect older adults' ability to transmit accurate information. In fact, older adults and informal caregivers are often surprised (and frustrated) to find out that health systems and SHHC agencies are not sharing information. The practice places a significant burden on older adults and informal caregivers already overwhelmed during the care transition period and points to an additional set of IM-related process failures to mitigate from the perspective of older adults and informal caregivers.

Finally, SHHC agencies and health systems were unaware of the extent to which IM-related process failures affected hospital/SHHC transitions, because there was not a feedback mechanism in place to capture these process failures. For example, experienced SHHCPs generally implemented individual strategies to deal with process failures without involvement of team managers or direct supervisors. Even if managers or

supervisors are involved, this information rarely gets back to the referring hospital. As a result, there was no clear feedback mechanism to the upper levels of the SHHC agency, much less to the health system, to show a need to improve the hospital/SHHC transition, making it difficult for the SHHC agency and the health system to function as true "learning organizations."[199]

Study findings in the context of the literature

Study findings extend our previous work[40,182-184] and those of others[111,181,185-187] identifying safety risks during hospital/SHHC transitions and support the need for further research to guide interventions to improve these high-risk transitions. Clearly, there is a need for developing infrastructure to reduce the occurrence of IM-related process failures and support situation awareness. Older adults are receiving SHHC services during a vulnerable time when they are at high risk for hospital readmission. The availability, accuracy, and usefulness of information during the SOC visit is critical to their health and safety.

Our finding of the important impact of external environmental and organizational factors supports others' work identifying similar factors affecting care transitions. For instance, Wolff, et al. challenge the usefulness of federal OASIS measures for identifying predictors of older adults' risk of experiencing suboptimal transitions.[25] Our findings that the use of these measures affect IM-related process failures add another reason for re-evaluating their use. Another important finding was that weekend SHHC admissions were associated with process failures, extending our previous work and those of others demonstrating challenges with weekend care transitions in other settings.[200-203]

In our review of the literature, we found strategies similar to our study findings and used by SHHCPs and patients to obtain needed information. Key strategies or workarounds used by SHHCPs to manage IM include taking handwritten notes to supplement existing information, learning about patient's health history based on patient's own account of what is occurring, and contacting physician offices to find a physician willing to take responsibility for a patient. Patients also describe challenges with manually tracking health data, needing time to process information when it is too much, and piecing together instructions post-discharge when not given enough information.[39,43,47,50,54,204,205]

As we do in this study, studies using HFE approaches in other healthcare settings have described the importance of taking a comprehensive approach to system improvement that considers a wide-variety of risk factors.[111,150,206] Though there are fewer studies specific to the home setting, our study findings are consistent with the variety of IM-related process failures found in the home care setting post-discharge, including erroneous information and information overload.[181]

Limitations

This study should be considered in the context of several limitations. First, though it focused on the experiences of participants at five study sites nationwide, findings may not reflect the experiences of SHHCP, older adults, or informal caregivers elsewhere. We did choose study sites that varied as to the type of population they serve (rural/urban), ownership structure (for-profit vs. non-profit), and affiliation with academic institutions (yes/no). As this was a qualitative study, the focus was not on generalizability, but rather on transferability; The information-related process failures

identified would likely resonate with similar stakeholders in other settings. Second, this study examined the work of SHHCPs, older adults, and informal caregivers. We did not study physicians, primarily because physicians have limited direct involvement in the execution of hospital/SHHC transitions. Additionally, we sought to highlight the voice of SHHCPs. The medical literature focuses mostly on physician perspectives and does not generally represent SHHCP perspectives.[170,183,184] Third, this study focused on the SOC visit, thus study findings do not reflect risk factors, IM-related process failures, or outcomes present during other phases of the care transition (e.g., hospital discharge, time after the SOC visit).

Strengths

Despite these limitations, our study has several strengths. First, we chose to focus on a portion of the most high-risk care transition, the hospital/SHHC transition. Much of the work to improve care transitions focuses disproportionately on improving the process of hospital discharge (the "senders"),[108] and this study begins to investigate the needs of the "receivers," in this case, SHHCP, older adults, and informal caregivers *after* hospital discharge. Second, we use HFE methods to identify threats to older adult safety during hospital/SHHC transitions. We have described elsewhere how HFE methods, though not frequently used, are particularly well-suited to evaluate contextual factors and develop an understanding of interactions among stakeholders within and across care settings.[109] Third, we obtain the perspectives of those most directly involved in hospital/SHHC transitions in order to have a comprehensive view and to give voice to those not well represented in the medical literature. Fourth, the credibility of our research findings rest in several practices commonly used in qualitative approaches:[188,189] prolonged

engagement in the field; member checking of findings with participants; and triangulation of methods (e.g., observations, interviews).

Implications, future directions, and conclusions

Study findings suggest that efforts to improve IM during the SOC visit (and likely hospital/SHHC transitions in general) need to be multi-faceted, targeting risk factors within the entire work system. In doing so, improvement efforts can address the range of IM-related process failures and resulting outcomes more comprehensively. Improvement efforts targeting only one aspect, such as providing patient education or ensuring medication reconciliation, fail to recognize the interdependencies with, and contributions of, other risk factors. Many programs to improve transitional care focus on arranging for post-discharge follow-up, often including arranging for SHHC services when appropriate,[57] yet few have specific protocols for improving information transfer to the very SHHCPs who will be most directly involved in implementing the care plan post-discharge.

Study findings also have implications for the design of tools and technologies to ensure situation awareness and support IM during care transitions. SHHC agencies are in need of centralized sources of information tailored to efficiently conduct the SOC visit, identify high-risk transitions, and effectively deliver care. The use of dashboards has been useful to capture, synthesize, and disseminate information in other settings, and researchers can consider using dashboards to capture information about suboptimal hospital/SHHC transitions in real time.[192,193] Researchers could enhance dashboards by including elements specific to SHHCP needs. Specifically, dashboards could include mobile, real-time updates on changes in the status of the following elements: plan of care,

informal caregiver availability, medical providers, home situation, services needed, equipment requests, and older adult and informal caregiver preferences for care. Finally, study findings have implications for adopting practices from high-reliability organizations to improve transitions, in particular developing protocols for providing feedback on care transition quality to SHHC agencies and health systems.[207] Future studies could examine which metrics of care transition quality would be most important and actionable to collect to support IM during care transitions.

Table 6: Characteristics of participating study sites

SHHC Agency Site	Ownership	Region	Average daily census	Average monthly admissions	Number of transitions observed
1	Not-for-profit	Urban	1,977	1,280	13
2	Not-for-profit	Urban	3,229	2,152	11
3	For-profit	Rural	98	28	8
4	For-profit	Urban/suburban	170	51	6
5	Not-for-profit	Urban/suburban	750	550	22

SHHC: Skilled home health care

Table 7: Top risk factors for information-related process failures during older adults' initial home visits after hospital discharge, by SEIPS element

External environment	**Definition/examples**
Insurance or bureaucratic challenges	Difficulties or hassles related to organizational or institutional policies, or to insurance regulations, e.g., ability to obtain coverage for home care, supplies associated with home care, and payment for medications
Cultural norms	Shared expectations and rules guiding behavior, e.g., views of illness and family caregiving expectations
Neighborhood factors	Resources, or lack thereof, to assist with recovery, e.g., community support, access to healthy food, transportation, and safe spaces to exercise
Liability concerns	Concerns about being legally responsible for something, e.g., falls or other adverse events
Internal environment	**Definition/examples**
Safety concerns	Issues putting the older adult at risk for falls or other adverse events, e.g., clutter, loose rugs, lack of grab bars
Lack of collaborative work	Lack of collaboration among family members or SHHCP to implement care plan, e.g., members not completing tasks
Disorganization of work	Lack of organization of tasks, e.g., inefficiencies, redundancies
Home modifications—need for	need for modifications to improve the home environment, e.g., grab bars, wheelchair ramp, stair glider, commode, hospital bed, removal of clutter, cleaning
Challenging living situation or family dynamics	Situation challenged by family dynamics, lack of resources, lack of informal caregiver, lack of supervision
Mobile office challenges	Home care provider is working out of a mobile office (ex: car, suitcase). Examples include, lack of access to certain supplies, difficulty carrying items, charging mobile devices
Lack of informal caregiver	Lack of informal caregiver available to help implement care plan at home

Ambiguity in accountability or roles	Unclear who is supposed to do what after hospital discharge, e.g., making follow-up appointments, obtaining medications, dressing wounds
Organization	**Definition/examples**
Organizational protocols, policies and initiatives	Protocols, policies, or initiatives do not make sense, create more work, hinder SHHCP natural workflow
Lack of support for SHHCP	Lack of help provided by the organization to the home care provider to perform the duties related to managing or executing transitions, such as facilitating communication and providing necessary resources
Weekend/off hours	Challenges related to accessing information or providing services after typical work hours or on the weekends, e.g., unable to reach medical providers, unable to order equipment
Ambiguity in accountability or roles	Unclear who is supposed to do what after hospital discharge, e.g., making follow-up appointments, obtaining medications, dressing wounds
Communication breakdown	Inability to communicate as needed and/or a disruption of the expected communication process, e.g., not receiving needed information, lack of timely response, etc. with others including physicians, patients and informal caregivers, other SHHCP, and the home care agency
Complexity of work, care plan	Complexity of tasks, such as medication reconciliation, making appointments, executing the care plan, managing medications
Lack of access to physician	Difficulties communicating with ordering or referring physician, or any physician involved in patient care decisions
Person	**Definition/examples**
Mismatched expectations or perceptions	Expectations of the older adult, SHHCP, informal caregiver, or physician do not match, i.e., "not being on the same page" with regards to the current health

	situation, prognosis, or what services are needed or will be provided
Patient education—need for	Older adult is not knowledgeable of their health condition, or what they need to do to manage their health
Advanced age	Age as a marker of vulnerability, a red flag, or an indicator of high risk
Lack of understanding of care plan	Older adult, informal caregiver, or SHHCP expressing lack of understanding regarding care plan and/or confusion about what has to be done to meet care needs. The care plan refers to any of the following: treatment plan, medication regimen, follow up appointments/tests, exercise/diet recommendations
Cognitive impairment	Loss of ability to think, remember, execute plans due to problems with mental functioning (e.g., dementia, delirium, depression)
Communication breakdown	Inability to communicate as needed and/or a disruption of the expected communication process, e.g., not receiving needed information, lack of timely response, etc. with others including physicians, patients and informal caregivers, other SHHCP, and the home care agency
Health literacy	Degree to which an individual has the capacity to obtain, communicate, process, and understand basic health information and services to make appropriate health decisions, e.g., patient and/or informal caregiver may not understand the relationship between their behavior and the patient's health
Health beliefs	Beliefs about the causes of illness and the illness experience, e.g., "God is punishing me," or "I don't believe in medications"
Ambiguity in accountability or roles	Unclear who is supposed to do what after hospital discharge, e.g., making follow-up appointments, obtaining medications, dressing wounds

Tasks	Definition/examples
Medications—incorrect use or storage	Incorrect medication, dose, frequency, or storage (e.g., not in refrigerator)
Medications—new	A new medication has been introduced with which the older adult is not familiar
Lack of access to physician	Difficulties communicating with ordering or referring physician, or any physician involved in patient care decisions
Tools/technology	**Definition/examples**
Equipment—need for	Older adult needs equipment to provide information to assist in their recovery, e.g., blood pressure cuff, glucometer, bathroom scale
Equipment—improper use	Older adult/informal caregiver with difficulty understanding how to use equipment
Problems using technology	Problems using devices, e.g., computer is slow, internet connection not available, battery dies, glucometers stops working, software crashes
Lack of usability	Tool is not intuitive or easy to use
Need for customization or integration	Tool is not modified to meet specific needs
Need for feedback	Tool does not give feedback when processes are not working as they should, or when data are out of acceptable range
Need for supervision	There is no supervision or assistance to assist with using the tool to ensure proper use
Need for cognitive aids	Tools, technologies, artifacts that people use to assist with their work or with managing their care, e.g., lists, calendars, notebooks, pillboxes, bags

SHHCP: Skilled home healthcare provider

Table 8: Older adult/informal caregiver, SHHCP, and organizational outcomes resulting from IM-related process failures

Process failure	**Outcome**								
	Delay or inefficiency	Poor communication	Plan of care not implemented	Non-adherence	Situation awareness not present	Error, adverse event	Worsening health	Workaround development	Stress, fear, frustration
Information conflict	X	X	X	X	X				
Erroneous information	X	X	X			X	X		
Information underload	X	X			X			X	X
Information scatter	X	X	X		X				X
Information overload	X	X			X		X		X

SHHCP: Skilled home healthcare provider; IM: Information management

Plate 3: Photograph of home care nurse, older adult, and dog during a home visit

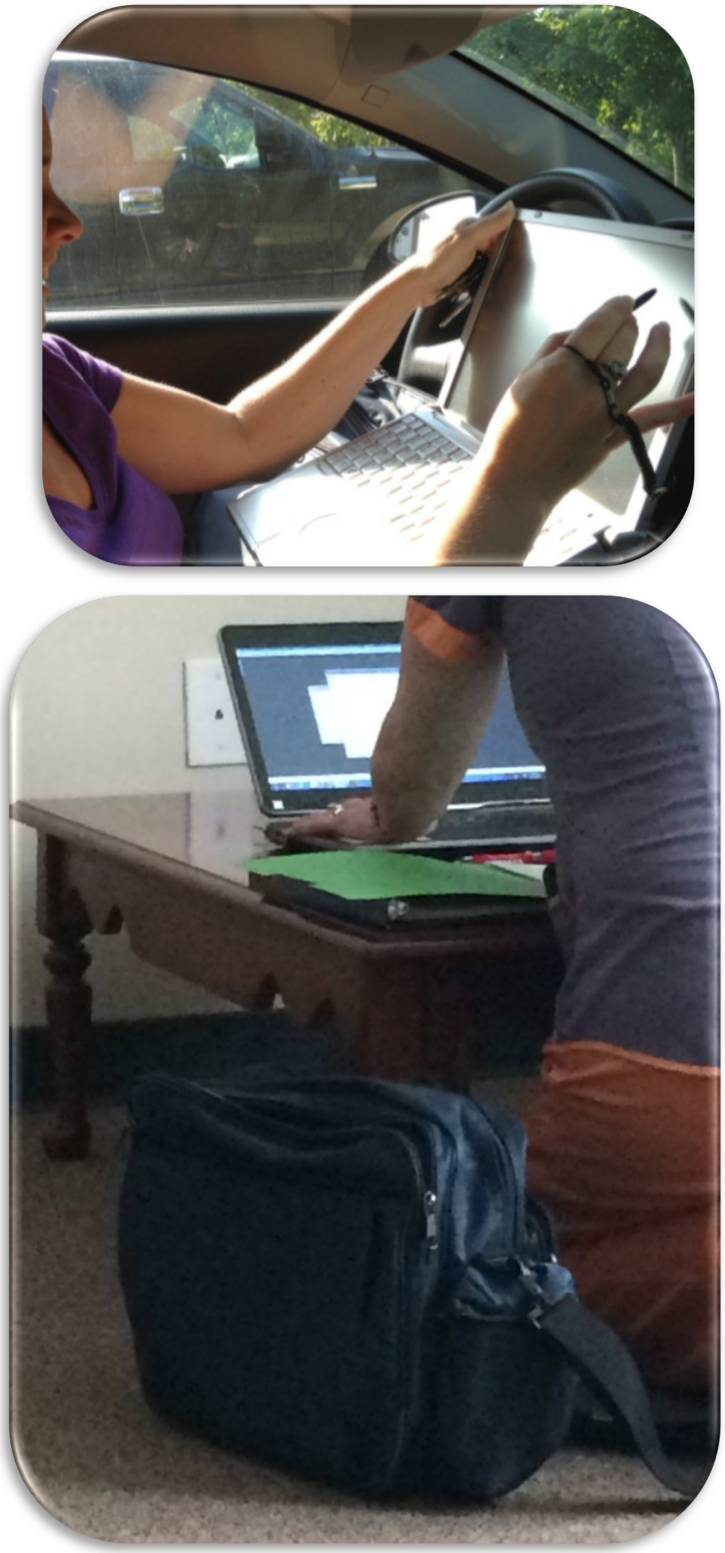


Plate 4: Photographs of skilled home healthcare providers interacting with technology within the confines of their "mobile offices"

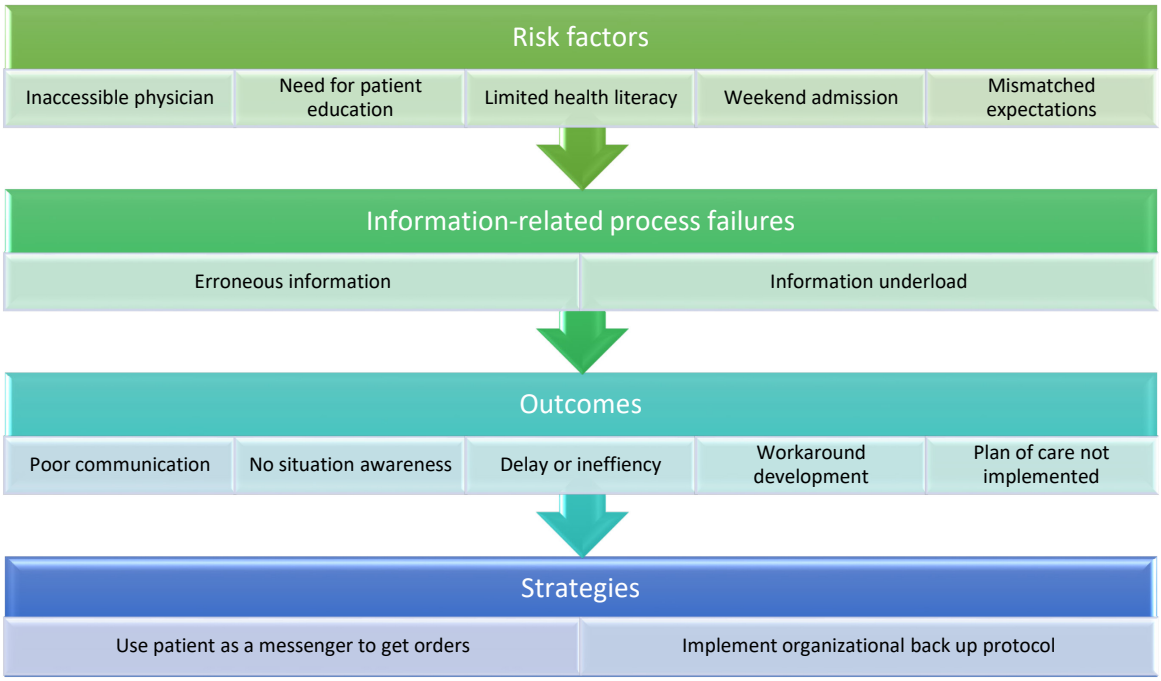


Figure 4: Scenario A: No orders available, No accessible physician

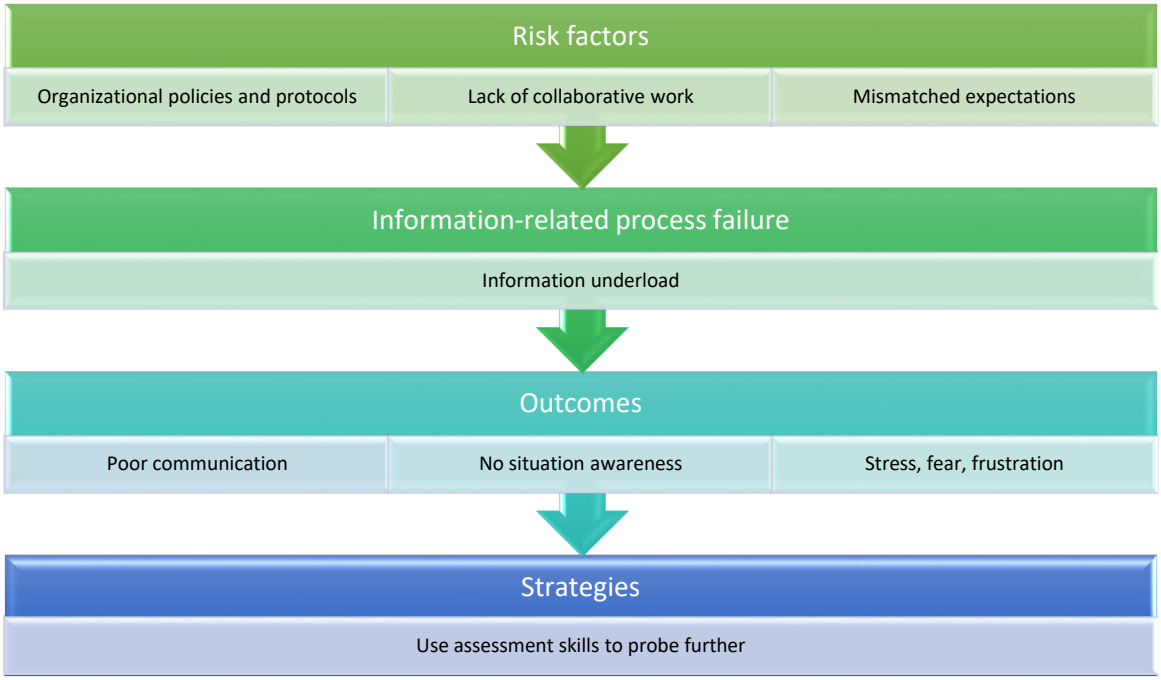


Figure 5: Scenario B: Referral form with missing diagnoses

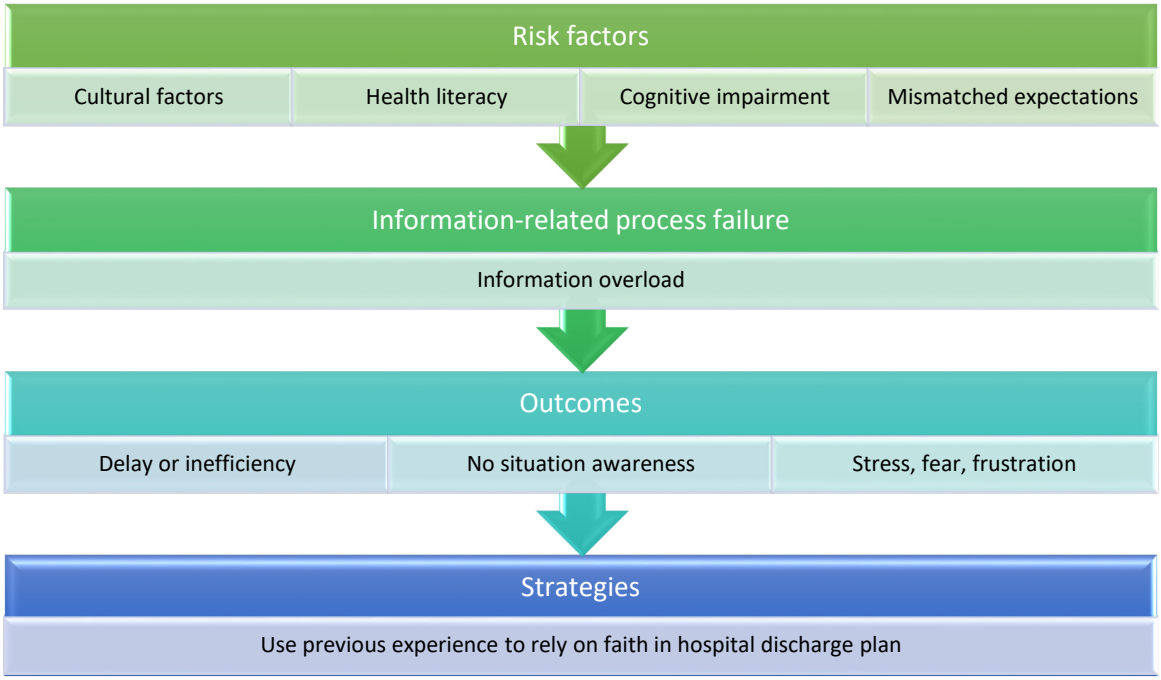


Figure 6: Scenario C: No time for informal caregiver to read hospital discharge instructions

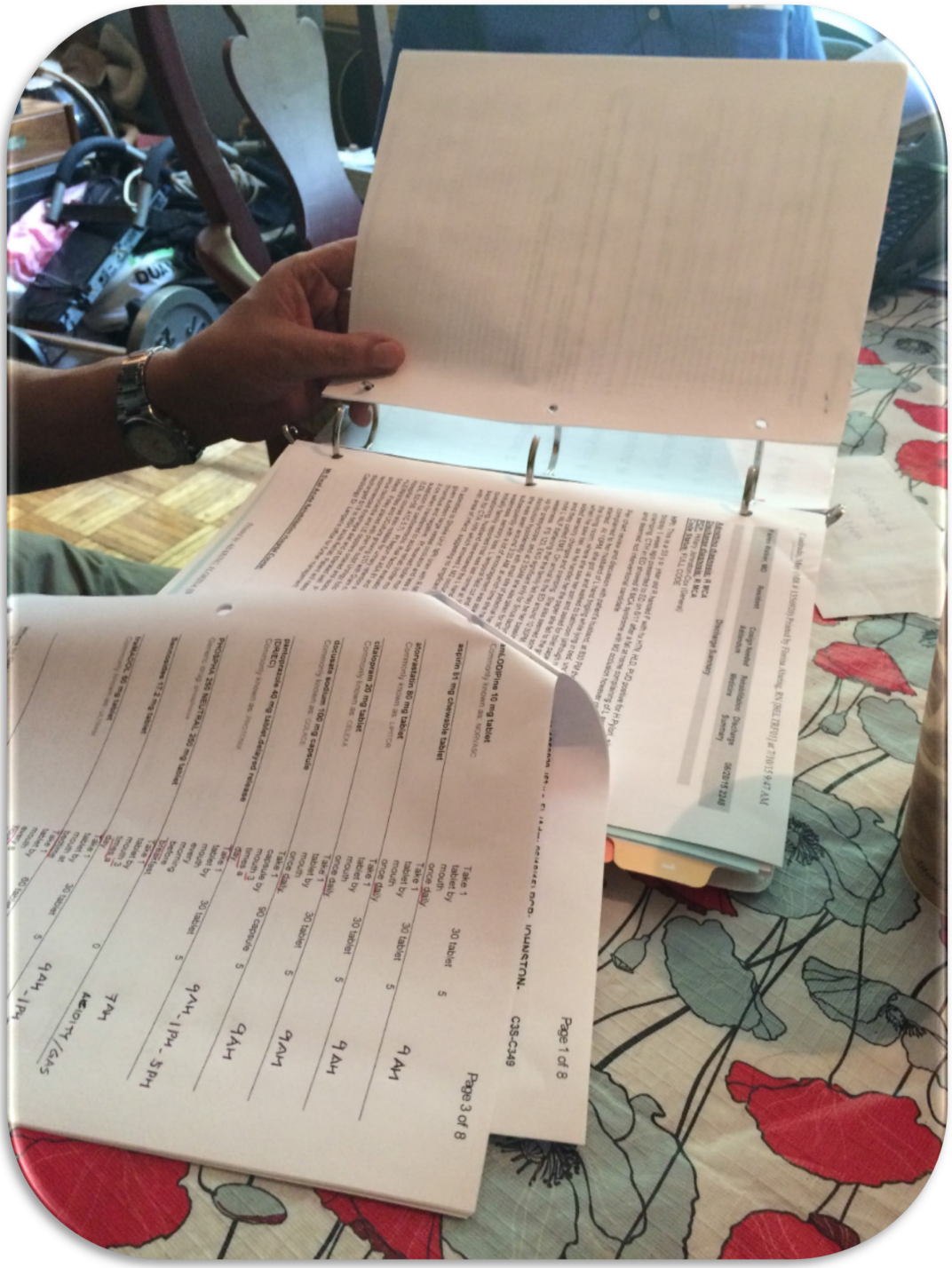


Plate 5: Example of binder of discharge information hospital gave to older adult

Chapter 4. Conclusions

This final chapter summarizes research findings from the analyses conducted for this dissertation. The remainder of the chapter discusses implications for key stakeholders involved during hospital/SHHC care transitions: health systems, SHHC agencies, healthcare providers, older adults, and informal caregivers. Finally, the chapter concludes with implications for researchers and policymakers.

Summary of research findings

Care transitions of older adults are common, complicated, and costly. The transition from hospital to receiving skilled home healthcare (SHHC) services in the home is especially risky, representing a key danger point for suboptimal information management (IM) leading to adverse outcomes. The analyses presented in this dissertation demonstrate the relationship among important system-level risk factors, IM-related process failures, and outcomes related to older adults' safety while received SHHC services after hospital discharge. Specifically, to understand how SHHCPs manage information during older adults' hospital/SHHC transitions, we have accomplished the following: 1) conducted a human factors engineering-informed assessment of key components of IM and IM-related process failures; and 2) investigated risk factors for, and outcomes of, IM-related process failures. We also described strategies SHHCPs use for obtaining information when facing process failures, and we developed a research agenda informed by the field of human factors engineering.

In Chapter 1, we first discussed the burden of care transitions in older adults, and we explored challenges in the SHHC setting that increase complexity and threaten older

adult safety. In particular, we introduced the challenge of IM during transitions and the need for strategies to incorporate real-time feedback to ensure safety.

We next described how the science of human factors engineering (HFE) could strengthen efforts to improve the hospital/SHHC transition. We presented the Systems Engineering Initiative for Patient Safety (SEIPS) 2.0 framework as applied to hospital/SHHC transitions, which served as the overarching framework for our work.

Finally, we provided a framework called Transitional Care 2.0 for developing the next generation of research and interventions to improve hospital/SHHC transitions. We concluded with a summary of key principles of the research agenda aimed at broadening the approach to care transitions research and intervention efforts for the hospital/SHHC transition.

We next conducted a HFE assessment of IM during hospital/SHHC transitions through a large, multi-site qualitative study at SHHC agencies across the United States.

In Chapter 2 we described how, guided by our HFE-informed conceptual framework, we identified key components of IM from the perspectives of skilled home healthcare providers (SHHCPs) directly responsible for executing older adults' hospital/SHHC transitions. We also described IM-related process failures during the SHHC admissions process and initial start-of-care (SOC) home visit after hospital discharge. We identified action steps involved in the flow of information during two phases of the hospital/SHHC transition: the SHHC admissions process primarily taking place in the hospital and at the SHHC agency; and the initial home visit. Within each of these action steps, we identified examples of IM-related process failures: too much

information for older adults to process upon hospital discharge (information overload); SHHCPs without access to complete information during the SOC visit (information underload); SHHC coordinators needing to access information from multiple places to prepare the initial referral (information scatter); older adult and informal caregivers' mismatched expectations regarding what SHHC services they will actually receive, compared with what they were told in the hospital (information conflict); and SHHCPs encountering wrong diagnoses or medication lists during the SOC visit (erroneous information). We also identified important characteristics of IM during hospital/SHHC transitions: overlap among roles, tasks, information sources, and information targets; propagation of IM-related process failures over time; and variation in IM across study sites.

Finally, we describe in Chapter 3 how we used qualitative methods to identify risk factors for IM-related process failures during SOC visits of older adults; 2) characterize older adult, SHHCP, and organizational outcomes of IM-related process failures; and 3) discuss strategies SHHCPs use to obtain needed information. We identified 278 risk factors for IM-related process failures during older adults' SOC visits after hospital discharge and described the most frequent risk factors contributing to IM-related process failures affecting older adults, caregivers, and SHHCPs during the SOC visit. We identified 34 outcomes resulting from these IM-related process failures, and we presented pathways describing patterns of risk factors leading to process failures and outcomes. We also identified three key strategies SHHCPs used to obtain needed information when facing IM-related process failures: using the older adult or caregiver as a messenger;

using alternative methods to access information, or seeing additional sources of information; and drawing on special relationships or connections with others.

Implications for key stakeholders

Implications for health systems and SHHC agencies

A key finding across our studies is a lack of SHHCP *situation awareness* providing an integrated picture of rapidly unfolding events during the hospital/SHHC transition. Situation awareness in the context of care transitions refers to SHHCPs having a working knowledge of what is happening with an older adult and their care plan at any given time (e.g., clinical status, medication changes, pending bloodwork). SHHCPs need this awareness to 1) evaluate the meaning of the information and its impact on what needs to be done to implement the care plan, and 2) use the information to predict what might happen in the future and thus guide educational interventions and contingency planning. Lack of situation awareness has important implications for the design of intervention efforts. This section describes recommendations for methods to support situation awareness.

Shared information portals and early warning systems

Health systems and SHHC agencies are in need of centralized and shareable sources of information tailored to support situation awareness and efficiently conduct the SOC visit, identify high-risk transitions, and effectively deliver care. These systems need to have the ability to push alerts to key stakeholders notifying them of critical information. Supporting situation awareness is ideally done in real time and at the point of care – sharing accurate information about the older adult is particularly important at hospital discharge and right before the SOC visit, the times when the initial post-

discharge plan of care is developed. Because supporting situation awareness requires information from multiple stakeholders across healthcare settings and across time, a key design implication is to use information technology to create shared information portals that also have the ability to send critical alerts. For example, a shared portal would serve as a centralized source of information for hospital staff, homecare coordinators, SHHCPs, older adults, and informal caregivers to both 1) retrieve information on the status of the older adult or their care plan, and 2) provide information relevant to modifying the care plan to others. While hospital multi-disciplinary rounds begin to serve this purpose by having everyone in the same room at the same time, rounds provide information at only one point at a time and do not facilitate real-time information exchange beyond that point. Moreover, older adults and informal caregivers are rarely included in rounds.

Study findings in this dissertation point to several design requirements for a shared information portal and early warning system to support situation awareness. First, the portal would need to facilitate shared information exchange across time, place, and person (including older adults and informal caregivers). Second, modifications to the older adult's care plan (e.g., medication changes, results of pending tests) would need to lead to notifications to key stakeholders in real time. Third, the portal would need to have the ability to use multiple media to store and convey information (e.g., video of how to use medical devices, audio of instructions for contingency planning, photographs of physical examination findings). Fourth, the portal would include decision support to identify action plans for when the SHHCP encounters IM-related process failures. Finally, the portal would need to be able to facilitate messaging among the medical team,

SHHC team, older adults, and informal caregivers, including alerts guided by algorithms or artificial intelligence capacity to identify evolving risky situations in real time.

Redefined roles for home care coordinators

In addition to a shared information portal, our data suggest the primacy of the role of the home care coordinator to consolidate information that is relevant to the SHHC agency. A shared information portal is unlikely to substitute for the need for a human being with a clinical background to organize and process information. What the shared portal can do is increase the home care coordinator's efficiency in gathering and transmitting information. More importantly, the gains from this efficiency could free up the home care coordinator to perform a more high-yield activity – facilitation of home assessments prior to hospital discharge. For example, the home care coordinator could gather video or photographs of the older adult's home to inform discharge planning decisions about the older adult's needs for durable medical equipment or a home safety evaluation after hospital discharge. The home care coordinator could gather this information directly by visiting the home, or they could facilitate informal caregivers to provide the information.

Meet-and-greets, and other ways of "trading places"

Study findings support the importance of finding ways for senders (information sources) and receivers (information targets) to understand each other's roles and the resources available in pre- and post-transition environments. In doing so, the information each person contributes during the transition will be more likely to be relevant and tailored to the receivers, as demonstrated in our previous work.[183] Moreover, the manner in which senders and receivers perceive each other is important in affecting their

willingness to make concerted efforts to convey important information. Meet-and-greet events (e.g., between hospital and SHHC staff) allow for senders and receivers to develop familiarity, connections, and relationships with each other. Study findings suggest these relationships are an important way to facilitate IM when facing process failures.

It may also be effective to have staff in one healthcare setting or role shadow another in a different setting or role. For example, hospital personnel could shadow an SHHCP during a home visit to understand both what SHHCPs do, and how older adults live. By "trading places" as such, each person develops a shared understanding of the other's world and is better able to appreciate their information needs. Each person is also more likely to have accountability and ownership over the care transition, rather than blaming the other side when a transition does not go well, as is commonly the case.

Proactive risk assessment to tailor improvement efforts

Health systems and SHHC agencies can use the HFE-informed methods of direct observation, contextual inquiry, and interviews used in this dissertation to identify threats to patient safety and facilitate proactive risk assessment, i.e., identification of threats to patient safety before harm occurs. Questions, such as "What could go wrong this person's care transition?" or "What would make your job easier?" could be asked of key stakeholders directly involved in care transitions. Identification of safety threats could be followed by a well-known proactive risk assessment method called healthcare failure modes and effects analysis (HFMEA),[208,209] which facilitates prioritization of safety threats and development of action plans. Human factors engineers could be included in the conduct of identification of safety threats and proactive risk assessment to assist with the design of improvement efforts.

Development of dashboards and feedback mechanisms to identify information-management-related process failures in real time

As we describe in Chapter 3, there is limited, if any, feedback provided to health systems and SHHC agencies when process failures occur. Feedback mechanisms are an important component of the practice of high-reliability organizations. Developing protocols for providing feedback on care transition quality to SHHC agencies and health systems could assist with improvement efforts. Feedback could take the form of dashboards identifying high-risk care transitions in real time. For example, organizations could charge quality officers, SHHC team managers, and hospital case managers with monitoring these dashboards on a daily basis and enacting organizational protocols to mitigate risk.

Implications for healthcare providers, older adults, and informal caregivers

Managing expectations and improving self-management ability

Study findings from this dissertation support the design of interventions to manage older adult and informal caregiver expectations around the hospital/SHHC transition, and improve older adult self-management at home. Mismatched expectations contributed to information conflict and erroneous information. Multi-media interventions, such as "discharge instruction videos" of how to complete tasks once at home, can be used to help older adults and informal caregivers understand what to expect after discharge. Videos could also teach older adults and informal caregivers what SHHCPs do (and do not do) in the home, and videos could show what a home nursing visit or physical therapy session looks like.

Strategies to improve self-management minimize information underload and erroneous information. Strategies could include the following: teach-back techniques ("Could you now tell me what we talked about today regarding which medications you will take when you get home?"; role playing of key tasks (e.g., administration of injections, dressing of wounds); and coaching ("Call your home nurse for these symptoms, and call 911 for these symptoms.") to activate older adults and informal caregivers on how to obtain information and guidance when needed.

Health systems and SHHC agencies can place a special emphasis on teaching older adults and informal caregivers about the use of medical devices in the home (e.g., nebulizers, oxygen concentrators, wound vacuum-assisted closure devices), because older adults may have their first experience using these devices after hospital discharge. We have published in our previous work a HFE-informed analysis of older adults' needs when managing medical devices in the home, and we established design requirements for appropriate use.[182] Developing interventions to improve self-management of these and other specific tasks could reduce the risk of information underload and erroneous information in the post-discharge period.

Cognitive and functional assessments of older adults and informal caregivers

Study findings highlight the role of information overload during the hospital/SHHC transition. While information overload can affect SHHCPs, it is primarily a problem for older adults and informal caregivers who may not be able to process or prioritize information as healthcare providers present it. As discussed in Chapter 2, cognitive impairment (e.g., delirium), fatigue, sleep deprivation, psychological distress, and the effort of the sheer number of tasks to complete after discharge may

compound information overload. Cognitive assessments of both the older adult and the informal caregiver prior to hospital discharge can be useful to evaluate their ability to understand and process information needed to implement the care plan.

In addition to cognitive assessments, functional assessments prior to discharge may be useful to identify the older adult and caregiver's combined ability to implement the care plan. Specifically, assessments can focus on their ability to perform the activities of daily living (e.g., bathing, toileting, dressing, feeding) relevant to the older adult's recovery. Study findings demonstrate that SHHCPs spend significant time in the home assessing whether the hospital staff referred an older adult appropriately for SHHC services, and there are efficiencies in making these assessments prior to discharge if possible.

Increasing physician accessibility and accountability

An important finding in this dissertation is the notable absence of physicians during the hospital/SHHC transition, impairing the SHHCP's ability to manage IM-related process failures. As discussed in Chapter 2, in many cases neither hospital-based nor ambulatory care-based physicians are easily accessible to assist SHHCP, older adults, and informal caregivers with contingency planning and development of recovery scenarios during the transition. Efforts to increase physician accessibility could include sharing additional contact information, such as access to "back lines," to circumvent automated voice answering systems and be able to directly access medical staff. Additionally, organizations can integrate EMR systems such that SHHC orders are sent directly to physicians' electronic inboxes. This integration would facilitate signing of

orders and reduce the number of faxes coming into the physician's office at the same time.

Physicians perceive limited accountability during the hospital/SHHC transition. Hospital-based physicians do not generally feel responsible for the older adult after hospital discharge. Ambulatory care-based physicians may not feel comfortable assuming or resuming care for the older adult without hospital providers first briefing them on the details of the hospital admission and hospital course. Efforts to improve IM could target communication between hospital-based and ambulatory care-based physicians to ensure the transmission of timely and quality discharge summaries. Efforts could also focus on ensuring "warm handoffs," i.e., verbal communication between physicians, under conditions we have described in our earlier work[183] where the nature of information to be transmitted is urgent, uncertain, or otherwise unable to be clearly conveyed in a discharge summary. Including SHHCPs in these communications could minimize the risk of SHHCPs using older adults and informal caregivers being used as "messengers" as discussed in Chapter 3.

Beyond medication reconciliation: Reducing treatment burden through assessments of medication appropriateness

Previously, we have published recommendations regarding the relationship between good palliative care and good transitional care.[108] An older adult is easier to transition across settings when there is a less complex care plan to which they must adhere. Medication reconciliation (i.e., processes to ensure medication lists match at each point in the care transition) often assumes that the medications to be reconciled are appropriate for the older adult. Physicians caring for older adults during care transitions

have an obligation to reassess the appropriateness of medications given the events that took place during hospitalization, and they must incorporate the older adult's life expectancy, co-morbid conditions, and goals of care. Resources exist for assisting physicians with "de-prescribing," i.e., reducing doses or eliminating medications that are no longer indicated.[210]

Implications for researchers and policymakers

Chapter 1 outlined the Transitional Care 2.0 framework we developed to guide research efforts to improve transitional care. This section describes examples of research agenda items emerging from this framework and from study findings. We also describe implications for policymakers interested in improving care transitions.

Development of measures of care transition quality

Developing protocols for providing feedback on care transition quality to SHHC agencies and health systems requires identification of quality metrics specific to the hospital/SHHC transition. Chapters 2 and 3 identified IM-related process failures, risk factors, and outcomes that can serve as measures health systems and SHHC agencies can operationalize for use in real time. Researchers could identify the best ways to obtain the data elements needed to collect and disseminate measures to key stakeholders. Researchers could also perform feasibility and usability testing of dashboards created from these measures. Policymakers could create incentives (e.g., grant allocations, tax incentives, insurance benefits) for the development and implementation of measurement protocols and dashboards for use in improving transitional care.

Development of protocols to assist health systems and SHHC agencies to manage IM-related process failures

Researchers can develop system-level strategies for health systems and SHHC agencies to identify IM-related process failures specific to their environment and patient population. Following this, researchers can assist health systems and SHHC agencies identify strategies for managing process failures. Strategies could include assistance with developing protocols for contingency plans and recovery scenarios when process failures occur. For example, a protocol to reduce information underload might be a patient-assistance hotline for older adults and informal caregivers recently discharged from the hospital to call if they have questions about the care plan.

As part of developing these protocols, researchers can also assist with identifying which information sources are the most useful, why they are useful, and how to make useful information more available. Study findings point to the critical importance of the SHHC referral form, because it serves as an integrated source of information during transitions, a time when more complete information is lacking. Policymakers could mandate the transfer of standardized data elements to SHHC agencies during transitions, such as the discharge summary and cognitive/functional status, to improve IM. Such mandates already exist for inter-facility transfers (e.g., hospital-to-hospital, hospital-to-skilled nursing facility).

Study findings from Chapter 3 demonstrate how risk factors in the external environment and in organizations considerably affect IM-related process failures. Researchers could develop interventions to address organizational culture change to improve safety culture and increase providers' sense of ownership and accountability

during the hospital/SHHC transition. Efforts to improve care transitions need to address the underlying reasons for physicians' absence during the critical transition period, such as lack of reimbursement. Researchers could also study different reimbursement mechanisms to assist policymakers in developing reimbursement strategies to incentivize cross-site communication.

Regional health information exchange

Chapter 2 described the information scatter and information underload that is often present during hospital/SHHC transitions and the lack of infrastructure to support IM during this time. Policymakers could create incentives for investments in information technology solutions for regional health information exchange to include information exchange among health systems, SHHC agencies, laboratories, imaging centers, health departments, and skilled nursing facilities. The state of Indiana has the largest regional health information exchange in the US and can serve as a model for how this infrastructure can be put into place.[211]

Future directions

We have made significant progress in understanding IM-related process failures, risk factors, and outcomes during older adults' hospital/SHHC transitions. We found risk factors in the external environment and in the organization considerably affected the risk of IM-related process failures during the SOC visit. IM-related process failures were associated with wide-ranging outcomes that could affect older adults' health, SHHCP morale, and organizational efficiency. Study findings suggest that efforts to improve IM during the SOC visit need to be multi-faceted, targeting risk factors within the entire

work system. Study findings also have implications for the design of tools and technologies to ensure situation awareness and support IM during care transitions.

Establishment and execution of roles during older adults' hospital/SHHC transitions

We have found in our earlier work that ambiguity in establishment and execution of roles also contributes to suboptimal care transitions. Establishment of roles refers to creating clear definitions of who is responsible for completion of healthcare tasks (e.g., medication administration, wound care) during the hospital/SHHC transition. Because SHHC services do not substitute for informal caregiving, there is often ambiguity in delineation of roles among SHHC providers and informal caregivers. To complement our work in understanding IM, future studies could investigate the key components of older adult, caregiver, SHHCP, and physician roles during hospital/SHHC transitions. Specifically, it would be important to understand barriers and facilitators to establishing and executing roles, and to investigate the distribution of roles and the effects on development and implementation of the care plan.

Developing a real-time dashboard to improve care transitions for older adults receiving skilled home care after hospital discharge

SHHC agencies are in need of centralized sources of information tailored to efficiently conduct the SOC visit, identify high-risk transitions, and effectively deliver care. The use of dashboards has been useful to capture, synthesize, and disseminate information in other settings. Researchers can consider using dashboards to capture information about suboptimal hospital/SHHC transitions in real time. Dashboards could include mobile, real-time updates on changes in the status of the key data elements, such as the plan of care, caregiver availability, cognitive/functional status, services needed,

equipment requests, and older adult and caregiver preferences for care. In our ongoing multi-site study, we are in the process of determining which IM- and role-related safety risks would be most important and actionable to collect and report in a dashboard to support IM. Study findings will be useful for SHHC agencies and serve as potential targets for interventions to improve older adults' hospital/SHHC transitions.

Appendix

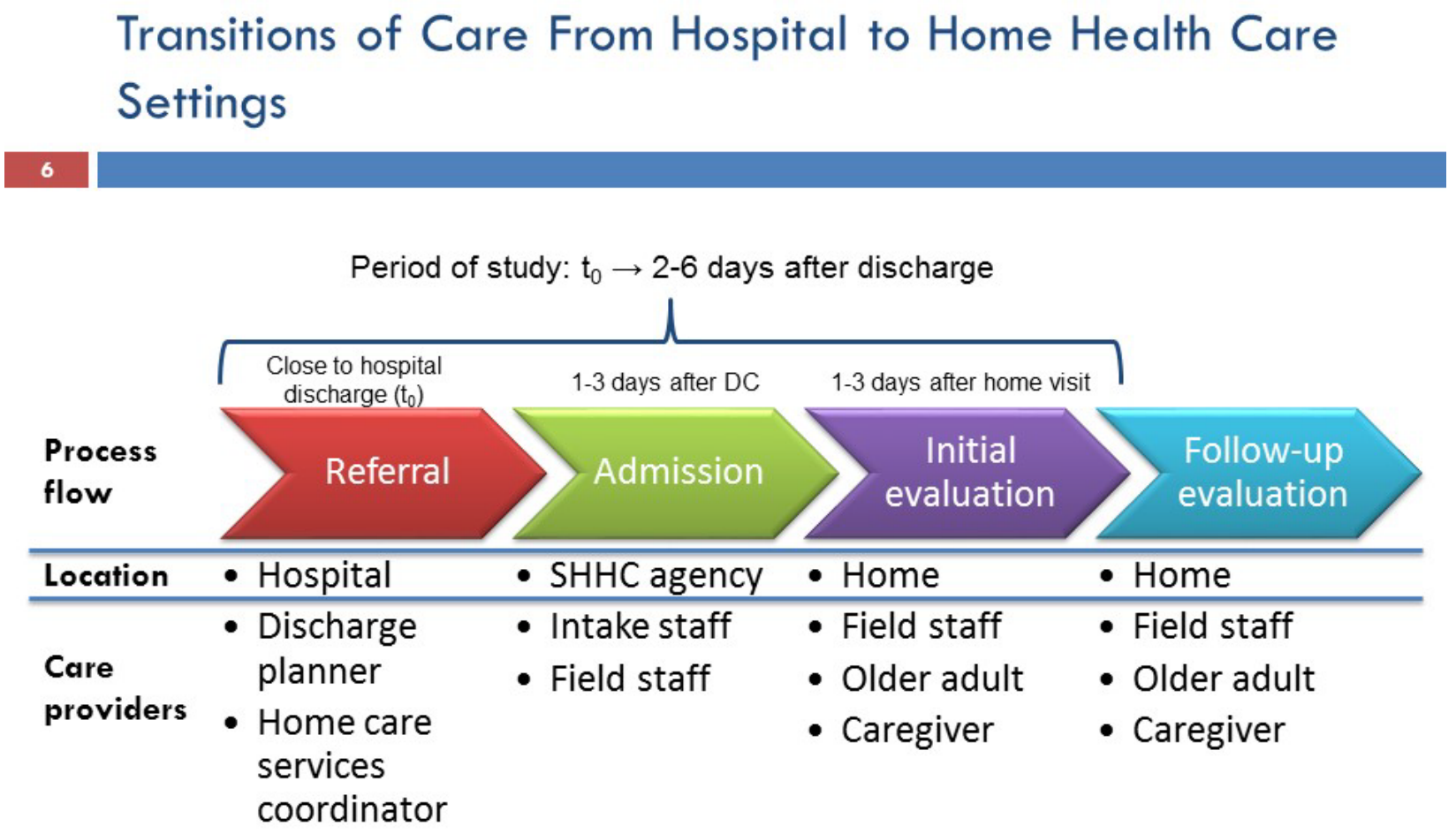


Figure 7: Study overview

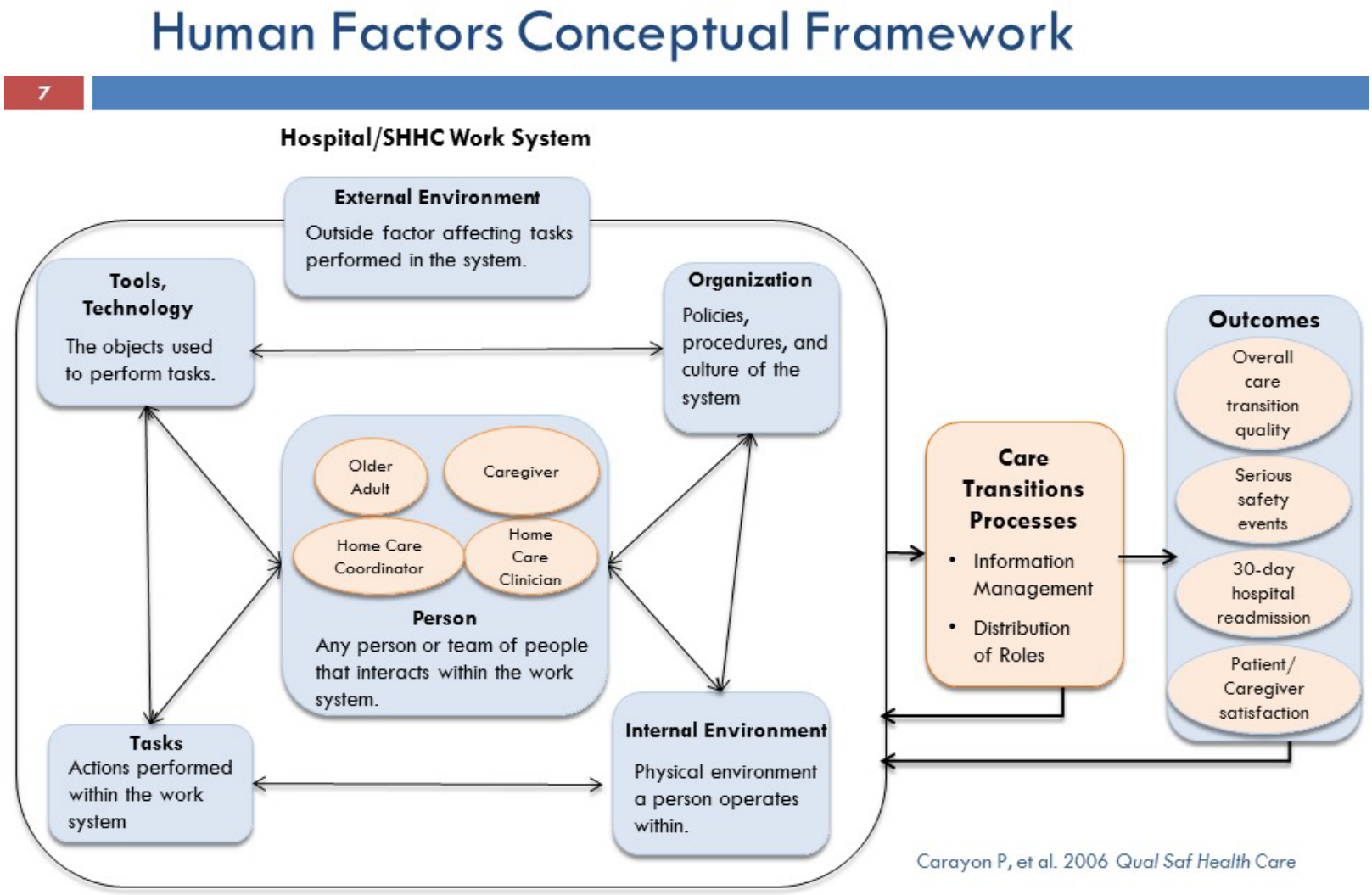
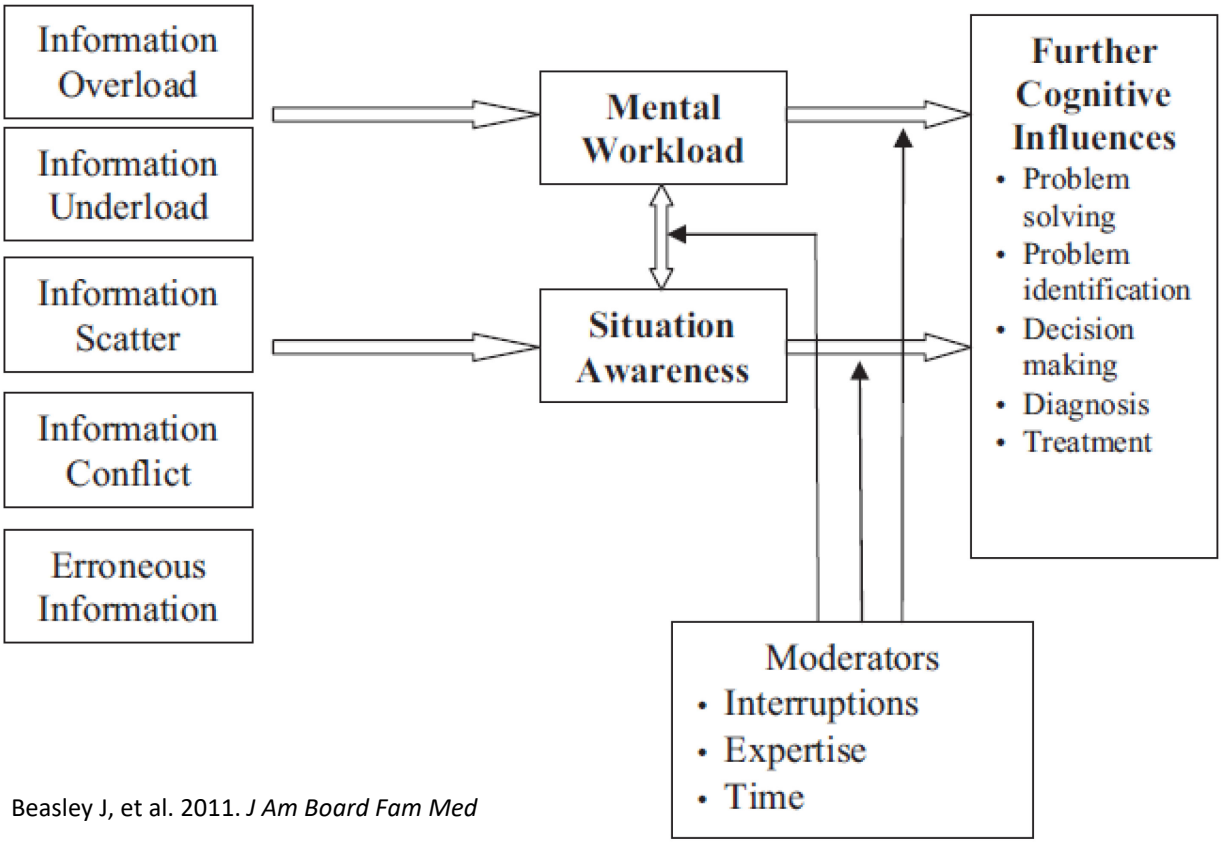


Figure 8: SEIPS 2.0 conceptual framework adapted for the hospital/SHHC transition



Beasley J, et al. 2011. *J Am Board Fam Med*

Figure 9: Information chaos conceptual framework

Table 9: Skilled Home Healthcare Provider Interview Guide

Turn on recorder and state the date, time, and initials of the interviewer.

- Can you please state your age, gender and race?
- Can you please tell me the number of years since you received your professional degree?
- Can you please tell me the number of years you have worked in the home care industry?
- Can you please tell me your job title here?

1. What was your role in ensuring a safe transition for this patient?
2. Were there any unusual circumstances or challenges associated with the transition of this patient? *NB: Interviewer should tailor specific prompts based on observations of the start of care*

Prompts

- Information challenges
- Communication challenges (patient/caregiver/providers)
- Medication challenges
- Home environment challenges
- Caregiver challenges
- Patient challenges
- Challenges with your equipment or technology

Now I'd like you to think about transitions from the hospital to home care in general:

3. What are some of the common challenges experienced when transitioning patients from the hospital to home care? Do you know what causes them?
4. What do you think are some of the reasons older adults return back to the hospital while receiving home care services?
5. Does your agency provide you with any tools or protocols to help you manage the care transition from hospital to home care? If yes, please describe?
6. Have you created any of your own strategies or tools to help you manage the care transition from hospital to home care?
7. Do you have any recommendations/suggestions that would make your job a little easier?
8. Any other comments or suggestions you would like to add?

Table 10: Older Adult/Informal Caregiver Interview Guide

Turn on recorder and state the date, time, and initials of the interviewer.

- To patient - Can you please state your age, gender and race? Can you please tell me what your relationship is to your caregiver?
- To caregiver - Can you please state your age, gender and race? How long have you been providing care to your (CR) (*NB: DO NOT USE NAMES)?*

1. **I would like you to think back to when you were getting ready to leave the hospital. The hospital providers were getting you ready to leave by telling you that you were going home and giving you information about leaving. This process is called the discharge process. Can you please describe what your discharge process was like?**
   Prompts:
   - How much notice were you given?
   - Who was involved?
   - Caregivers present?
   - What happened?
   - **What could have gone better?**

   Prompts:
   - Any frustrations?
   - Delays?
   - Challenges getting from hospital to home?
   - Challenges understanding or following instructions?
   - **What went particularly well?**

   Prompts:
   - Particularly helpful materials?
   - Transportation
   - Medications/equipment ready
   - **Based on your discharge process and instructions, how prepared did you feel to take care of your health condition at home? (Why?)**

2. **Thinking back to before you met with the home are provider today, what were your expectations for what they could do for you?**
   Prompts:
   - How often they would come?
   - How long you would be receiving home care?
   - What types of services they would provide?

3. **And now that you have met the home care provider, how have those expectations changed?**

Prompts:

- Any surprises? Things you were surprised they could/could not do?
- Something you wish they would do?
- Things you thought they could do that they cannot?

4. **What types of strategies do you use or have you created to help you manage your care since you've been home from the hospital?**
   Prompts:

   - Notebooks; calendars; phone or computer applications; websites; pill boxes

5. **What issues have come up since leaving the hospital that were unexpected or challenging?**
   Prompts:

   - Communicating with providers; scheduling medical appointments or tests; acquiring equipment or supplies, transportation; level of care needed; challenges with the layout of the home (e.g., bathroom on 2nd floor); medication challenges

6. **Any comments or suggestions that you have about your transition from the hospital to home and into home health care services?**

7. **Do you have any questions for me?**

Table 11: Key Informant Interview Guide

Turn on recorder and state the date, time, and initials of the interviewer.

1. Can you please state your age, gender and race?
2. Can you please tell me the number of years since you received your professional degree?
3. Can you please tell me the number of years you have worked in the home care industry?
4. Can you please tell me your job title here?
5. Can you please describe what your role is?
6. Can you please describe your role in transitioning patients from hospital to home care?
7. Can you please describe your role in ensuring safe transitions of patients from hospital to home?
8. How do you find out about patients in need of home care following hospital discharge?
9. Could you describe an ideal transition from hospital to home care?
10. What are some of the things that work well for you in transitioning patients from the hospital to home care?
11. What do you think are the reasons older adults return to the hospital while receiving home care services?
12. Once a patient is identified, can you please walk me through the specific steps you go through to transition the patient to home care services?
13. What are some of the common challenges you experience with care transitions from the hospital to home care?
14. Does your agency provide you with any tools or protocols to help you manage the care transition from hospital to home care?
15. Have you created any of your own strategies or tools to help you manage the care transition from hospital to home care?
16. Do you have any recommendations/suggestions that would make your job easier?
17. Any other comments or suggestions you would like to add?

Table 12: Analytical coding framework

Barriers	**Facilitators**	**Person(s) involved**	**Descriptions**	**Outcomes: Patient/Caregiver, Employee, Organizational**	**Timepoint during transition**
Access to care challenges	Adaptability	Administrator	cognitive aid examples	adherence	Home care admissions process
adaptability - need for	Caregiver presence	Home care coordinator	High risk indicators	communication - good	Hospital discharge
age as a risk factor	collaborative work	Informal Caregiver	home modifications	Communication - poor	Time after SOC/ROC visit
Ambiguity in accountability	comprehensive assessments in place	Older Adult	Hospital experience	Delay or inefficiency	Time between hospital discharge and first visit
Appropriateness for home care - patient not appropriate	contingency planning in place	Physician	Ideal transitions - components	Dissatisfaction	
barriers of smooth transitions	continuity of care in place	Skilled home healthcare provider	indicators for calling upon organizational resources	distrust	
barriers to manage situation in general	facilitators of smooth transitions		Information management - components	engagement	
bureaucratic or insurance challenges	facilitators to manage situation in general		Medication management - components	Error, adverse event	

Barriers	Facilitators	Person(s) involved	Descriptions	Outcomes: Patient/Caregiver, Employee, Organizational	Timepoint during transition
Care plan - different perspectives regarding plan	feeling valued and understood		patient preparation for discharge	health - better	
Care plan - lack of understanding	follow-up appointment - scheduled		Reasons for readmission	Health - worse	
Care plan - uncertainty in plans or changing plans	High SES		role - administrative tasks	morale - high	
Care plan - unwilling/unable to implement	Important role - family caregiver, aide, other		role - advocacy	Morale - low	
challenges navigating the system	income - high		role - assessment	nonadherence	
cognitive impairment	living situation - ideal		role - documentation	organizational health - better	
collaborative work - lack of	matched expectations		role - education / coaching	organizational health - worse	
Communication breakdown	organizational dynamics		role - ensuring safety	plan of care is not implemented	
complexity - of tasks, work, care plan	organizational pride		role - general tasks	quality of life - better	
complications experienced	organizational protocols		role - identifying the cause of a problem	Quality of life - worse	

Barriers	Facilitators	Person(s) involved	Descriptions	Outcomes: Patient/Caregiver, Employee, Organizational	Timepoint during transition
comprehensive assessments - need for	organizational support for clinical provider		role - information gathering	satisfaction	
contingency planning - need for, or lack of	patients' preferences and goals of care		role - reinforce/implement plan of care	Situation awareness - not present	
continuity of care - need for, or lack of	Previous experience with the situation		role - set expectations	situation awareness - present	
Coordination - Challenges coordinating across multiple people	Professional experience - extensive		role - social support	stress, fear, frustration	
cultural norms	teamwork - effective		Role - specific tasks during care transitions	team cohesiveness	
cultural or neighborhood factors			Strategies for high-risk patients or transitions	trust	
disconnect between what is said and what is observed			Strategies for implementing plan of care	Unable to provide care	
disorganization - of work or tasks			strategies for smoother transitions	Unplanned healthcare utilization	
equipment - delivery issues			strategies for staying healthy and out of the hospital	withdrawal	Start of care/ROC visit
equipment - need for, or lack of			Surprises encountered	Workaround development	

Barriers	Facilitators	Person(s) involved	Descriptions	Outcomes: Patient/Caregiver, Employee, Organizational	Timepoint during transition
equipment - use/ lack of use, or improper use			wish list--one thing to make things easier		
family dynamics			Workaround examples		
follow-up appointment - not scheduled					
functional impairment					
Geography - Challenges related to geographic location/specific community					
Handwritten documents - Challenges reading					
health beliefs					
health literacy					
hesitation to bother others					
High volume of work					
Home modifications - need for, or lack of					
Important role - family caregiver, aide, other					
income - LOW					

Barriers	Facilitators	Person(s) involved	Descriptions	Outcomes: Patient/Caregiver, Employee, Organizational	Timepoint during transition
incomplete recovery					
information - conflicting					
information - erroneous					
information - missing/incomplete, lacking specificity					
Information - multiple sources; Information Scatter					
information - overload					
Information - Underload					
Insurance challenges					
lack of caregiver presence					
liability concerns					
limitation of role, working outside the scope					
living situation - challenging					
Medications - complex regimen					
Medications - incorrect use or storage					

Barriers	Facilitators	Person(s) involved	Descriptions	Outcomes: Patient/Caregiver, Employee, Organizational	Timepoint during transition
medications - new					
Mental health problems impairing recovery					
mismatched expectations					
Negative perception - of home care, hospital services, living facility					
not feeling valued and understood					
not wanting to be a burden					
Office - mobile office challenges					
Office - shared or no office space					
organizational dynamics - lack of					
Organizational policies and initiatives - causing challenges					
organizational pride - lack of					
organizational protocols - lack of					

Barriers	Facilitators	Person(s) involved	Descriptions	Outcomes: Patient/Caregiver, Employee, Organizational	Timepoint during transition
patient as a messenger					
patient education - need for, or lack of					
patient requests for support					
patient task work not being done					
patient work					
patient work system					
patients' preferences and goals of care					
person acting independently without checking with others					
Personality conflict					
Physician - lack of access					
physical environment factors					
Physician - lack of availability					
physician accountability					
policies not matching workflow					
policy change - need for					

Barriers	Facilitators	Person(s) involved	Descriptions	Outcomes: Patient/Caregiver, Employee, Organizational	Timepoint during transition
Previous experience with the situation - lack of					
problematic healthcare conditions					
Professional experience - limited					
professional work					
professional's goal for patient					
Redundancy or extra step in process					
Religion as an influence					
risk of institutionalization					
role confusion					
role uncertainty					
Roles - Challenges with team members in different roles					
Safety - personal safety challenges					
safety concerns					
sedentary lifestyle					

Barriers	**Facilitators**	**Person(s) involved**	**Descriptions**	**Outcomes: Patient/Caregiver, Employee, Organizational**	**Timepoint during transition**
setting expectations					
Socioeconomic challenges; Low SES					
task characteristics					
task clarity					
task confusion					
teamwork - ineffective					
tension between ideal and routine role					
Time - need for more					
timing and notice of hospital discharge					
tools - need for					
tradeoffs					
transportation concerns					
unaware of problem potentially taking place					
uncertainty					
usability					

Barriers	Facilitators	Person(s) involved	Descriptions	Outcomes: Patient/Caregiver, Employee, Organizational	Timepoint during transition
Weekends/off hours					
workarounds to get orders implemented					

Table 13: Characteristics of older adults, by site

Characteristic	Site 1 n=13	Site 2 n=11	Site 3 n=8	Site 4 n=6	Site 5 n=22	All Sites N=60
Mean age (yrs.)	70.2	72.3	78.9	73.5	75.0	73.8
Female (%)	84.6	72.7	75.0	50.0	59.1	68.3
Race/Ethnicity (%)	%	%	%	%	%	%
African American	46.2	9.1	0	0	9.1	15.0
Asian	0	9.1	0	0	0	1.7
Caucasian	15.4	27.3	100	100	90.9	65.0
Hispanic	23.0	45.4	0	0	0	13.3
Other	7.7	0	0	0	0	1.7
Unknown	7.7	9.1	0	0	0	3.3

Table 14: Characteristics of caregivers, by site

Characteristic	Site 1 n=10	Site 2 n=4	Site 3 n=5	Site 4 n=4	Site 5 n=17	All Sites N=40
Mean age (yrs.)	58.1	53.5	66.4	68.0	67.7	62.9
Female (%)	50.0	50.0	40.0	75.0	76.5	62.5
Race/Ethnicity (%)	%	%	%	%	%	%
African American	69.0	25.0	0	0	0	17.5
Asian	0	25.0	0	0	0	2.5
Caucasian	30.0	25.0	100	100	0	32.5
Hispanic	10.0	25.0	0	0	0	5.0
Other	0	0	0	0	0	0
Unknown	0	0	0	0	100	42.5

Table 15: Characteristics of key informants, by site

Characteristic	Site 1 n=9	Site 2 n=12	Site 3 n=6	Site 4 n=6	Site 5 n=0	All Sites N=33
Female (%)	100	83.3	66.7	100	N/A	87.9
Mean age (yrs.)	57.7	45.0	47.5	39.67	N/A	48.0
Mean years in homecare industry	23.1	16.6	12.3	10.5	N/A	16.5
Mean years since professional degree	29.0	22.9	21.3	14.7	N/A	22.5
Race/Ethnicity (%)	%	%	%	%	%	%
African American	33.3	25.0	0	0	N/A	18.2
Asian	0	16.7	0	0	N/A	6.0
Caucasian	66.7	41.7	83.3	100	N/A	66.7
Hispanic	0	8.3	0	0	N/A	3.0
Other	0	8.3	16.7	0	N/A	6.1
Role (%)	%	%	%	%	%	%
Nurse	11.1	0	0	16.7	N/A	6.1
Rehabilitation therapist	0	0	33.3	0	N/A	6.1
Administrator/Coordinator	88.9	100	66.7	83.3	N/A	87.8

Table 16: Characteristics of skilled home healthcare providers, by site

Characteristic	Site 1 N=10	Site 2 N=9	Site 3 N=5	Site 4 N=3	Site 5 N=19	All Sites N=46
Female (%)	100	88.9	80.0	66.7	100	93.5
Mean age (yrs.)	44.9	46.4	40.6	36.3	N/A	43.5
Mean years in homecare industry	13.8	13.9	7.7	6.2	11.9	11.8
Mean years since professional degree	19.5	14.8	12.8	14.0	16.8	16.4
Race/Ethnicity (%)	%	%	%	%	%	%
African American	50.0	55.5	0	33.3	0	23.9
Asian	10.0	11.1	0	0	0	4.4
Caucasian	20.0	11.1	100	66.7	0	26.4
Hispanic	20.0	22.2	0	0	0	4.0
Other	0	0	0	0	0	0
Unknown	0	0	0	0	100	41.3
Role (%)	%	%	%	%	%	%
Nurse	90.0	77.8	60.0	66.7	57.8	69.6
Rehabilitation therapist	10.0	11.1	40.0	33.3	21.1	19.6
Administrator/Coordinator	0	0	0	0	21.1	8.6

Characteristic	Site 1 N=10	Site 2 N=9	Site 3 N=5	Site 4 N=3	Site 5 N=19	All Sites N=46
Other (home health aide)	0	11.1	0	0	0	2.2

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Curriculum Vitae

The Johns Hopkins University School of Medicine

DEMOGRAPHIC AND PERSONAL INFORMATION

Current Appointments

University

2003 – present	Member, Lipitz Center for Integrated Care, Department of Health Policy and Management, Bloomberg School of Public Health, Johns Hopkins University
2007 – present	Director, Transitional Care Research, Center for Transformative Geriatric Research, Division of Geriatric Medicine and Gerontology, Johns Hopkins University
2007 – present	Core Faculty, Center for Transformative Geriatric Research, Johns Hopkins University
2007 – present	Aliki Faculty Scholar, Johns Hopkins Bayview Internal Medicine Residency Program
2012 – present	Member, Welch Center for Prevention, Epidemiology, and Clinical Research, Johns Hopkins University
2012 – present	Scholar, Armstrong Institute for Patient Safety and Quality, Johns Hopkins University
2014 – present	Core Faculty, Center for Innovative Care in Aging, Johns Hopkins University School of Nursing
2016 – present	Core Faculty, Armstrong Institute for Patient Safety and Quality, Johns Hopkins University
2016 – present	Associate Professor, Department of Medicine, Division of Geriatric Medicine and Gerontology, Johns Hopkins University

Hospital

2007 - present	Aliki Attending Physician, Johns Hopkins Bayview Medical Center

Other None

Personal Data

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Education and Training

Undergraduate

1995	B.A., *summa cum laude,* Chemistry, and B.A., *summa cum laude,* Medical Sociology, University of Kansas, Lawrence, KS

Doctoral/graduate

1999	M.P.H., Healthcare Management, Harvard University School of Public Health, Boston, MA
2000	M.D., Medicine, *cum laude,* Yale University School of Medicine, New Haven, CT

Postdoctoral

2000 – 2003	Intern and Resident, Internal Medicine, Yale-New Haven Hospital, New Haven, CT
2003 – 2005	Fellow, Robert Wood Johnson Clinical Scholars Program, Johns Hopkins University School of Medicine, Baltimore, MD. Primary mentors: Drs. Chad Boult, Neil Powe
2005	Certificate in Business of Medicine, Johns Hopkins University School of Professional Studies in Business and Education, Baltimore, MD
2006	Certificate in Faculty Development**,** Johns Hopkins University School of Medicine, Baltimore, MD
2005 – 2007	Clinical and Research Fellow, Center on Aging and Health, Division of Geriatric Medicine and Gerontology, Johns Hopkins University School of Medicine, Baltimore, MD. Primary mentors: Drs. Bruce Leff and Joseph Carrese
2012 – present	Ph.D. candidate in Clinical Investigation, Armstrong Patient Safety Scholar, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD. Primary mentors: Drs. Bruce Leff, Ayse Gurses, Albert Wu

Professional Experience

2007	Instructor, Center on Aging and Health, Division of Geriatric Medicine and Gerontology, Department of Medicine, Johns Hopkins Medical Institutions, Baltimore, MD
2007 – 2016	Assistant Professor, Department of Medicine, Division of Geriatric Medicine and Gerontology, Johns Hopkins University

2007 – present	Director, Transitional Care Research, Center on Aging and Health, Division of Geriatric Medicine and Gerontology, Johns Hopkins University
2007 – present	Core Faculty, Center on Aging and Health, Johns Hopkins University
2007 – present	Aliki Faculty Scholar, Johns Hopkins Bayview Internal Medicine Residency Program
2012 – present	Scholar, Armstrong Institute for Patient Safety and Quality, Johns Hopkins University
2014 – present	Core Faculty, Center for Innovative Care in Aging, Johns Hopkins University School of Nursing
2016 – present	Core Faculty, Armstrong Institute for Patient Safety and Quality, Johns Hopkins University
2016 – present	Associate Professor, Department of Medicine, Division of Geriatric Medicine and Gerontology, Johns Hopkins University

PUBLICATIONS

Original Research

1. Hayashi J, Phillips K, **Arbaje AI,** Sridharan A, Gajadhar R, Sisson S. A Curriculum to Teach Internal Medicine Residents to Perform House Calls for Older Adults. *J Am Geriatr Soc.* 2007; 55(8):1287-1294; [OR] [SI/QI].

    - Role: conceptual design, design of qualitative research methods, data collection, data analysis and interpretation, manuscript writing

2. ***Arbaje AI**, Wolff J, Yu Q, Powe NR, Anderson GF, Boult CE. Post-Discharge Environmental and Socioeconomic Factors and the Likelihood of Early Hospital Readmission among Community-Dwelling Medicare Beneficiaries. *Gerontologist.* 2008; 48(4):495-504; *corresponding author; [OR].

3. ***Arbaje AI**, Maron DD, Yu Q, Wendel VI, Tanner E, Boult C, Eubank KJ, Durso SC. The Geriatric Floating Interdisciplinary Transition Team. *J Am Geriatr Soc*. 2010; 58(2):364-370; *corresponding author; [OR] [SI/QI].

4. Wendel VI, Tanner E, Cayea D, **Arbaje AI,** Durso SC. Implementing Staff Nurse Geriatric Education in the Acute Hospital Setting. *Medsurg Nurs.* 2010 Sep-Oct; 19(5):274-80; quiz 281; [OR] [SI/QI].

    - Role: conceptual design, data analysis and interpretation, manuscript writing

5. Sato M, Shaffer T, **Arbaje AI,** Zuckerman IH. Residential and Health Care Transition Patterns among Older Medicare Beneficiaries Over Time. *Gerontologist.* 2011 Apr; 51(2):170-8. Epub 2010 Dec 21; [OR].

- Role: conceptual design, creation of research collaborative across institutions, data collection, data analysis and interpretation, manuscript writing

6. Graham LE, Leff B, **Arbaje AI**. Risk of Hospital Readmission for Older Adults Discharged on Friday. *J Am Geriatr Soc.* 2013 Feb; 61(2):300-1; [OR].

   - Role: conceptual design, data analysis and interpretation, manuscript writing, research mentor

7. Schoenborn N, **Arbaje AI**, Eubank KJ, Maynor KA, Carrese JA. Clinician Roles and Responsibilities during Care Transitions of Older Adults. *J Am Geriatr Soc*. 2013 Feb; 61(2):231-6; [OR].

   - Role: conceptual design, formation of research working group, design of qualitative research methods, data collection, data analysis and interpretation, manuscript writing

8. ***Arbaje AI,** Newcomer AR, Maynor KA, Duhaney RL, Eubank KJ, Carrese JA. Excellence in Transitional Care of Older Adults and Pay-for-Performance: Perspectives of Healthcare Professionals. *Jt Comm J Qual Saf.* 2014 Dec; 40(12):550-558; *corresponding author; [OR].

9. Kohli P, **Arbaje AI,** Leff B, Statom D, McNabney M. Assisted Living Facility Use by the Program of All-Inclusive Care for the Elderly (PACE). *J Am Geriatr Soc.* 2015; (63):594-6; [OR].

   - Role: design of qualitative research methods, data collection, data analysis and interpretation, manuscript writing

10. ***Arbaje AI**, Yu Q, Newhall KA, Leff B. Prevalence, Geographic Variation, and Trends in Hospital Services Relevant to the Care of Older Adults: Development of the Senior Care Services Scale and Examination of Measurement Properties. *Med Care* 2015; (53): 768–775; *corresponding author; [OR].
    NOTE: For media coverage concerning this article see Media Coverage of Research Nos. 6-10.

11. Nasarwanji MF, Werner NE, Carl K, Hohl D, Leff B, Gurses AP, **Arbaje AI**. Identifying Challenges associated with the Hospital to Skilled Home Healthcare Transition Workflow: Perspectives of Home Healthcare Agency Providers. *Home Health Care Serv Q.* 2015 Jul-Dec; 34(3-4):185-203; Epub 2015 Oct 23; [SI/QI].

    - Role: conceptual design, design of qualitative research methods, data collection, data analysis and interpretation, manuscript writing, research mentor

12. Wong, EG, Parker AM, Leung DG, Brigham EP, **Arbaje AI**. Association of Severity of Illness and Intensive Care Unit Readmission: A Systematic Review. *Heart Lung*. 2016 Jan-Feb; 45(1):3-9.e2; [OR] [SI/QI].

    - Role: conceptual design, data collection, data analysis and interpretation, manuscript writing, research mentor, alternate corresponding author

13. ***Arbaje AI**, Werner NE, Kasda EM, Wu AW, Locke CFS, Aboumatar H, Paine LA, Leff B, Davis RO, Boonyasai RT. Learning from Lawsuits: Using Malpractice Claims Data to Develop Care Transitions Planning Tools. *J Patient Saf.* 2016 Jun 10. [Epub ahead of print]. *corresponding author; [OR] [SI/QI].

14. Werner NE, Gurses AP, Leff B, **Arbaje AI**. Improving Care Transitions across Healthcare Settings through a Human Factors Approach. *J Healthc Qual* 2016 Jul 14. [Epub ahead of print] [OR].

    • Role: conceptual design, manuscript writing, research mentor

15. Keller SC, Gurses AP, Werner N, Hohl D, Hughes A, Leff B, **Arbaje AI**. Older Adults and Management of Medical Devices in the Home: Five Requirements for Successful Use. *Popul Health Manag (in press)*; [OR] [SI/QI]

    • Role: conceptual design, data collection, data analysis and interpretation, manuscript writing, research mentor

Review Articles

1. ***Arbaje AI**. Curbside consultation. Determining Eligibility for Gastric Bypass Surgery [for older adults]. *Am Fam Physician.* 2006; 73(9):1-2; *corresponding author; [RA].

2. Rooney M, **Arbaje AI.** Changing the Culture of Practice to Support Care Transitions—Why Now? *Generations: Journal of the American Society on Aging, Special issue: Care Transitions in an Aging America.* Winter 2012-2013; 36(4):63-70; [RA].

    • Role: conceptual design, content expertise, manuscript writing, senior advisor

3. Clark JH, Yeagle J, **Arbaje AI,** Lin FR, Niparko JK, Francis HW. Cochlear Implant Rehabilitation in the Elderly: Literature Review and Proposal of a Conceptual Framework. *J Am Geriatr Soc.* 2012 Oct; 60(10):1936-45. Epub 2012 Sep 13; [RA].

    • Role: formation of research collaboration, conceptual design, data analysis and interpretation, manuscript writing

4. Keller S, Gurses AP, **Arbaje AI**, Cosgrove SE. Learning from the Patient: Human Factors Engineering in Outpatient Parenteral Antimicrobial Therapy. *Am J Infect Control.* 2016 Jul 1;44(7):758-60. Epub 2016 Mar 2.; [RA].

    • Role: formation of research collaboration, providing transitional care expertise, manuscript writing

Case Reports None

Book Chapters, Monographs

1. ***Arbaje AI**. Improving Care Transitions for Older Adults, in *Geriatric Care by Design,* ed. A. Chun, C. Irmiter, and J. Schwartzberg (Chicago, IL: American Medical Association, 2011); *corresponding author; [BC].

2. ***Arbaje AI,** Boonyasai RT, Dilworth-Anderson, P. The Older Person in Transition: Implications for Pathways of Transitions of Care, in "Pathways through the Transitions of Care for Older Adults." *Annu Rev Gerontol Geriatr* New York, NY: 2011; 31; *corresponding author; [BC].

3. ***Arbaje AI**. Transitional Care. In: Durso SC, Sullivan GM, eds. *Geriatrics Review Syllabus: A Core Curriculum in Geriatric Medicine, 8th ed*. New York, NY: American Geriatrics Society: 2013; *CORRESPONDING AUTHOR; [BC].

4. Bowman EH, Flood KL, **Arbaje AI.** Models of Care to Transition from Hospital to Home. In: Malone M, Capezuti E, Palmer RM, editors. "Acute Care for Elders: A Model for Interdisciplinary Care." New York, NY: Springer Science and Business Media; 2014:175-202; [BC].

   - Role: conceptual design, content expertise, manuscript writing, senior advisor

5. ***Arbaje AI.** Transitions in Care. In: Medina-Walpole A, Pacala JT, Potter JF, eds. *Geriatrics Review Syllabus: A Core Curriculum in Geriatric Medicine, 9th ed*. New York, NY: American Geriatrics Society; anticipated publication 2016 (e-pub ahead of print http://geriatricscareonline.org/); *corresponding author; [BC].

Books, Textbooks None

Other Publications

Proceedings Reports

1. Bisantz AM, Carayon P, Miller A, Khunlerkit A, **Arbaje AI**, Xiao Y. Using Human Factors And Systems Engineering To Improve Care Coordination. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting,* September 2012; vol. 56, 1: pp. 855-859; [PR].
   - Role: conceptual design of symposium, content expertise, manuscript writing, presentation of research

Guidelines/Protocols, Consensus Statement, Expert Opinion, Consortium Articles

1. ***Arbaje AI,** Kansagara D, Englander H, Salanitro A, Kripalani S, Jencks S, Lindquist L. Regardless of Age: Incorporating Principles from Geriatric Medicine to Improve Care Transitions for Patients with Complex Needs. *J Gen Intern Med.* 2014 Feb 21 [Epub ahead of print]. 2014 Jun; 29(6):932-9; [GL]. *corresponding author
   NOTE: For media coverage concerning this article see Media Coverage of Research Nos. 1-5.

2. Lindquist LA, Miller RK, Saltsman WS, Carnahan J, Rowe TA, **Arbaje AI,** Werner N, Boockvar K, Steinberg K, Baharlou S. SGIM-AMDA-AGS Consensus Best Practice Recommendations for Transitioning Patients from Skilled Nursing Facilities to the Community. *J Gen Intern Med.* 2016 Oct 4. [GL].
   - Role: transitional care content expertise, literature review, manuscript writing, preparation of scientific symposia and presentation of findings at national and international meetings

Editorials None

Research Letters/White Papers/Brief Reports None

Letters, Correspondence None

Media Releases or Interviews

Media Releases

1. **Arbaje AI**. Lessons learned managing geriatric patients offer framework for improved care. EurekAlert, March 11, 2014. http://www.eurekalert.org/pub_releases/2014-03/jhm-llm031114.php; [MR].
2. **Arbaje AI**. Framework for improved care offered by lessons learned managing geriatric patients. MedicalNewsToday.com, March 13, 2014. http://www.medicalnewstoday.com/releases/273926.php; [MR].
3. **Arbaje AI**. Lessons learned managing geriatric patients offer framework for improved care. Press-News.org, March 11, 2014. http://press-news.org/124113-lessons-learned-managing-geriatric-patients-offer-framework-for-improved-care.html; [MR].
4. **Arbaje AI**. Lessons Learned Managing Geriatric Patients Offer Framework for Improved Care for Those With Complex Health Problems. Magazon, March 12, 2014. http://www.beintoday.com/?p=2052; [MR].
5. **Arbaje AI**. Lessons Learned Managing Geriatric Patients Offer Framework for Improved Care for Those With Complex Health Problems. Johns Hopkins Bayview Medical Center, March 11, 2014. http://www.hopkinsmedicine.org/johns_hopkins_bayview/about_hospital/news_publications/news_2014/03_11_geriatric_care_transitions_improvement.html; [MR].
6. Researchers Develop Data-Driven Framework to Evaluate Availability of Hospital Services for Older Adults. Johns Hopkins Medicine website, 2015. http://www.hopkinsmedicine.org/johns_hopkins_bayview/about_hospital/news_publications/news_2015/09_09_senior_care_mismatch.html; [MR].
7. Researchers Develop Data-Driven Framework to Evaluate Availability of Hospital Services for Older Adults. Johns Hopkins Medicine News and Publications website, 2015. http://www.hopkinsmedicine.org/news/media/releases/researchers_develop_data_driven_framework_to_evaluate_availability_of_hospital_services_for_older_adults; [MR].
8. Gallucci-White, G. Older adults find gap between health needs, available care: Senior Care Services Scale developed by Johns Hopkins researchers. The Daily Record, 2015. http://thedailyrecord.com/2015/10/02/older-adults-find-gap-between-health-needs-available-care/; [MR].
9. Researchers Develop Data-Driven Framework to Evaluate Availability of Hospital Services for Older Adults. Health Canal, October 9, 2015. http://www.healthcanal.com/geriatrics-aging/66801-researchers-develop-data-driven-framework-to-evaluate-availability-of-hospital-services-for-older-adults.html; [MR].
10. Arbaje, AI. Services for Elders: How good are we at providing healthcare services to older people? Johns Hopkins Medicine Podcast, October 9, 2015. http://podcasts.hopkinsmedicine.org/2015/10/05/october-9-2015-services-for-elders/; [MR].
11. Arbaje AI, Yu Q, Newhall KA, Leff B. Prevalence, geographic variation, and trends in hospital services relevant to the care of older adults: development of the senior care services scale and examination of measurement properties. AHRQ News Now, 2016. http://www.ahrq.gov/news/newsletters/e-newsletter/543.html .

Interviews —Television

Note: Interviews aired on "Good Morning, Maryland" on WMAR-TV, ABC Channel 2, Baltimore, Maryland, available at www.youtube.com/aarbaje.

1. **Arbaje AI**. Seniors and the Price of Drugs (4:02). November 11, 2008.
2. **Arbaje AI**. Geriatric Medicine: When to go to a Geriatric Doctor (3:12). January 13, 2009.
3. **Arbaje AI**. Staying Safe with Your Medications (3:32). February 3, 2009.
4. **Arbaje AI**. Flu and Winter Concerns (3:31). March 3, 2009.
5. **Arbaje AI.** Preventing Falls (3:27). April 7, 2009.

6. **Arbaje AI.** Understanding the H1N1 Virus (2:50). May 5, 2009.
7. **Arbaje AI.** Insomnia (3:59). June 2, 2009.
8. **Arbaje AI.** Getting Rid of Joint Pain (4:21). July 7, 2009.
9. **Arbaje AI.** Hitting the Road with a Travel Checklist (3:18). August 4, 2009.
10. **Arbaje AI.** Planning Ahead: Advanced Directives (3:54). September 1, 2009.
11. **Arbaje AI.** Dealing with Blood Pressure (3:14). October 6, 2009.
12. **Arbaje AI.** Giving from the Soul, Good for the Body (Benefits of Volunteering) (8:38). November 3, 2009.
13. **Arbaje AI.** Avoiding Unpleasant Holiday Surprises (3:57). December 8, 2009.
14. **Arbaje AI.** Top Ten New Year's Resolutions for Older Adults (3:14). January 5, 2010.
15. **Arbaje AI.** Winter Safety (3:36). February 2, 2010.
16. **Arbaje AI.** Stigma Symptoms in Older Adults (3:50). March 2, 2010.
17. **Arbaje AI.** Health Care Reform for Older Adults (2:46). April 6, 2010.
18. **Arbaje AI.** Caring for Older Parents (4:15). May 3, 2010.
19. **Arbaje AI.** Navigating the Care Transition from Hospital to Home (4:38). June 15, 2010.
20. **Arbaje AI.** Staying Safe in the Heat (4:09). July 6, 2010.
21. **Arbaje AI.** Tips for Older Adults Considering Visits to Retail Medical Clinics (4:21). August 10, 2010.
22. **Arbaje AI.** Getting Enough Vitamin D (3:59). September 7, 2010.
23. **Arbaje AI.** Preparing for Elective Surgery (3:46). October 12, 2010.
24. **Arbaje AI.** Dealing with Delirium. November 2, 2010.
25. **Arbaje AI.** Winterizing Yourself, Part I. December 7, 2010.
26. **Arbaje AI.** Winterizing Yourself, Part II (3:05). January 4, 2011.
27. **Arbaje AI.** Neurological Symptoms Experienced by Reporter on Air (4:27). February 15, 2011.
28. **Arbaje AI.** Older Adults and Heart Disease (4:09). February 15, 2011.
29. **Arbaje AI.** Understanding Home Health Care. March 1, 2011.
30. **Arbaje AI.** Embarrassing Symptoms to bring up with your Doctor. April 12, 2011.
31. **Arbaje AI.** Understanding and Preventing Outdoor Falls. May 10, 2011.
32. **Arbaje AI.** Heat-related Safety for Older Adults. June 7, 2011.

Note: Spanish-language interviews

33. **Arbaje AI.** When to See a Geriatrician (Spanish, 6:50). Bogotá, Colombia. August 18, 2011. http://www.semana.com/multimedia-vida-moderna/cuando-ir-geriatra/4367.aspx
34. **Arbaje AI.** Importance of Quality Care for Older Latinos (Spanish, 5:33). Interview aired on December 8, 2011 on "Directo USA" on CNN en Español, www.youtube.com/aarbaje
35. **Arbaje AI.** "Resumen Matinal," Santo Domingo, Dominican Republic, January 14, 2016, ("Morning Summary"). Interview aired on Channel 25.
36. **Arbaje AI.** "Salúd en Día," Santo Domingo, Dominican Republic, January 14, 2016, ("Health for the day"). Interview aired on Channel 25.
37. **Arbaje AI.** "Noticiero Nacional," Santo Domingo, Dominican Republic, January 14, 2016, ("Evening National News"). Interview aired on Channel 25.
38. **Arbaje AI.** "Conversando Contigo: Silvia García", Santo Domingo, Dominican Republic, January 15, 2016, (Conversing with you, hosted by Silvia Garcia), Channels 12 and 45. https://youtu.be/e-mPF2mc45U

Note: Interviews aired on "NBC Nightly News with Brian Williams" on WBAL-TV, NBC Channel 11, Baltimore, Maryland.

39. **Arbaje AI**. Successful agers enjoy life to the fullest (1:53). February 20, 2013. http://video.msnbc.msn.com/nightly-news/50859012
40. **Arbaje AI.** College towns doubling as retirement communities (2:40). February 21, 2013. http://video.msnbc.msn.com/nightly-news/50880368

Interviews—Radio

1. **Arbaje AI.** Caring for Latino Elders (60:53). (Spanish language) Interview aired on May 18, 2009 on Radio Bilingüe, program #5779. http://www.archivosderb.org/?q=es/audio/by/guest/alicia_arbaje
2. **Arbaje AI.** The Importance of Home Health Care for Older Adults. Aired on July 18, 2012 on Maryland Morning with Sheilah Kast on 88.1 WYPR—National Public Radio http://www.wypr.org/podcast/7-18-12-care-home
3. **Arbaje AI.** Tips for Maintaining your Health as You Get Older (Spanish language). Aired on March 25, 2014 on "Tu Familia" on El ZOL 107.9 FM http://www.jhcentrosol.org/what-we-do/radio-shows/
4. **Arbaje AI.** Healthcare for Older People after they've Left the Hospital. Aired on September 2, 2013 on The Health Report with Dr. Norman Swan on the Australian Broadcasting Corporation http://www.abc.net.au/radionational/programs/healthreport/improving-healthcare-delivery-for-older-adults/4928798
5. **Arbaje AI.** Special Issues for Older Adults during the Winter (Spanish language). Aired on December 21, 2014 on "Tu Familia" on El ZOL 107.9 FM http://www.jhcentrosol.org/what-we-do/radio-shows/
6. **Arbaje AI.** Special Issues for Older Adults during the Winter (Spanish language). Aired on November 22, 2015 on "Tu Familia" on El ZOL 107.9 FM http://www.jhcentrosol.org/what-we-do/radio-shows/
7. **Arbaje AI.** "Tribuna Democrática" (Spanish language, "The Democratic Tribunal"). Aired on January 6, 2016 on 93.3 FM, Santo Domingo, Dominican Republic.
8. **Arbaje AI.** "Receta Médica" (Spanish language, "The Medical Prescription"). Podcast aired on January 6, 2016 on Z101 FM, Santo Domingo, Dominican Republic. http://www.z101digital.com/app/pod_cast_play.aspx?id=7805&p=0&t=3&n=%20La%20Receta%20M%C3%A9dica%20de%20la%20Z%20de%20este%20mi%C3%A9rcoles%2013-01-2016&s=1

Other Media: Dissemination to Scientific Audiences [OM]

Electronic / Print

1. **Arbaje AI**. An Older Woman with Oliguria: Prevention of Contrast-Induced Nephropathy. Published March 2, 2006, on the *Johns Hopkins University Geriatric Education Website:* http://www.hopkinsmedicine.org/gec/studies/contrast_induced_nephropathy

Note: The following articles are available at www.medicusamicus.com

2. **Arbaje AI.** Geriatricians in Demand (Russian). *Medicus Amicus*. 2009; N1: 10, 17.
3. **Arbaje AI.** Depression in Older Adults (Russian). *Medicus Amicus*. 2009; N2: 16-17, 19.
4. **Arbaje AI.** Vaccinations Important for Older Adults (Russian). *Medicus Amicus*. 2009; N3: 24-25.

Other Media: Dissemination to Lay Audiences [OM]

Electronic/Print

1. **Arbaje AI.** Concerns about the Vulnerability of Older Adults to the H1N1 Influenza of Swine Origin (Spanish). *El Mundo. Health Supplement,* Spain. May 21, 2009; N747 http://www.elmundo.es/suplementos/salud/2009/747/1242856808.html
2. **Arbaje AI.** Navigating Care across Settings: The Role of Caregivers. Published December 13, 2011, on the Robert Wood Johnson Foundation Human Capital Blog website: http://blog.rwjf.org/humancapital/2011/12/13/navigating-care-across-settings-the-role-of-caregivers/
3. **Arbaje AI.** Getting the Best Care for Mom and Dad. Published June 28, 2012 on the Robert Wood Johnson Foundation Human Capital blog website: http://www.rwjf.org/humancapital/product.jsp?id=74566

Note: The following articles are available at www.royalgazette.com

4. **Arbaje AI.** Advice to Seniors: Get Out in the Sun. *The Royal Gazette,* Bermuda. June 9, 2009
5. **Arbaje AI.** How Exercise, Sleep, and Diet Can Keep the Brain and Memory Sharp in Old Age. *The Royal Gazette,* Bermuda. June 9, 2009
6. **Arbaje AI.** Aches and Pains. *The Royal Gazette,* Bermuda. June 16, 2009
7. **Arbaje AI.** Watch for the Signs of Severe Grief. *The Royal Gazette,* Bermuda. June 16, 2009
8. **Arbaje AI.** Treating Depression in the Elderly. *The Royal Gazette,* Bermuda. June 16, 2009
9. **Arbaje AI.** Get the Right Type of Footwear. *The Royal Gazette,* Bermuda. June 30, 2009
10. **Arbaje AI.** Warning Signs: Are You at Risk? *The Royal Gazette,* Bermuda. June 30, 2009
11. **Arbaje AI.** Preventing Falls. *The Royal Gazette,* Bermuda. June 30, 2009
12. **Arbaje AI.** What Needs to Be in Every Medicine Cabinet. *The Washington Post.* February 18, 2010. http://www.washingtonpost.com/wp-dyn/content/article/2010/02/16/AR2010021605327.html
13. **Arbaje AI.** Keeping Cool Especially Important for Seniors. *Baltimore Sun.* July, 2010. http://weblogs.baltimoresun.com/health/2010/07/keeping_cool_especially_import.html
14. **Arbaje AI.** Tips for Seniors to Brave the Heat. *Baltimore Sun.* June, 2011. http://weblogs.baltimoresun.com/health/2011/06/tips_for_seniors_to_brave_the.html
15. **Arbaje AI.** Triple-digit heat wave continues in Maryland. Baltimore aims to help vulnerable seniors. Baltimore Sun. July, 2011. http://www.baltimoresun.com/health/bs-hs-heat-seniors-20110721,0,1608405.story?page=2
16. **Arbaje AI.** Geriatric Care for Older Latinos (Spanish). *ABC Medicus.* August, 2011. *http://www.abcmedicus.com/content/Alicia-Arbage-y-la-Medicina-Geri-trica*
17. **Arbaje AI.** You can teach an old brain new tricks. *The Australian Financial Review*. August 28, 2013. http://bit.ly/16Mq9BV
18. Reddy, S. Scientists' new goal: growing old without disease: Researchers plan to test a pill to prevent or delay Alzheimer's, heart disease and other ailments that come with age. (**Arbaje AI** quoted in article.) *The Wall Street Journal: Life & Culture*. March 10, 2015. http://www.wsj.com/articles/scientists-new-goal-growing-old-without-disease-1426542180
19. **Arbaje, AI.** Top Things to Know for a Safe Trip to the Hospital. *Abordo*, Tame Airlines inflight magazine (Ecuador) May/June 2015 edition.

20. **Arbaje AI.** Healthy Aging: Strategies to Prevent Common Problems as You Get Older. Webinar, December, 2011. http://bit.ly/geriatricsvideo
21. **Arbaje AI**. Which are better for seniors: vegetarian, vegan, or high animal protein diets? Examiner.com, March 11, 2014. http://www.examiner.com/article/which-are-better-for-seniors-vegetarian-vegan-or-high-animal-protein-diets

Note: The following articles are available at http://www.hopkinsmedicine.org/health/healthy_aging

22. **Arbaje AI**. How to Cope with a Later-Life Crisis. 2014
23. **Arbaje AI**. Protect Against a Retirement Risk. 2014
24. **Arbaje AI**. Do You Have a Healthy Number of Friends? 2014
25. **Arbaje AI**. Tough (But Important) Conversations. 2014
26. **Arbaje AI**. Medical Records: Getting Organized. 2014
27. **Arbaje AI**. Five Little Health Issues That May Be Bigger Than You Think. 2014
28. **Arbaje AI**. Surprising Facts about Falls. 2015
29. **Arbaje AI.** Top Things to Know for a Safe Trip to the Hospital. *Articles and Answers*, a Johns Hopkins University website. 2015. http://www.hopkinsmedicine.org/health/articles-and-answers/wellbeing/top-tips-for-a-safe-stay-at-the-hospital?utm_medium=email&utm_source=InsideHopkins&utm_campaign=Health&utm_term=TipsForASafeHospitalStay&utm_content=HealthSection
30. **Arbaje AI.** Top Things to Know for a Safe Trip to the Hospital. Johns Hopkins Centro Sol's website, 2015. http://www.jhcentrosol.org/community-2/estadiasegurahospital/
31. **Arbaje AI.** Top Things to Know for a Safe Trip to the Hospital. Johns Hopkins Centro Sol's Facebook page, 2015. https://www.facebook.com/jhcentrosol
32. **Arbaje AI.** Top Things to Know for a Safe Trip to the Hospital. Latin Opinion Baltimore Newspaper, 2015. http://www.jhcentrosol.org/what-we-do/newspaper-health-columns/
33. **Arbaje AI.** Top Things to Know for a Safe Trip to the Hospital. www.Olderhood.com (Bermudian website), 2015.
34. **Arbaje AI.** Hospital discharge: It's one of the most dangerous periods for patients. *The Washington Post*. April, 29, 2016. https://www.washingtonpost.com/news/to-your-health/wp/2016/04/29/from-hospital-to-home-a-dangerous-transition-for-many-patients/?hpid=hp_rhp-top-table-main_transition-420pm%3Ahomepage%2Fstory
35. **Arbaje AI.** Patient dangers persist post-discharge. *Fierce Healthcare*. May 2, 2016. http://www.fiercehealthcare.com/story/patient-dangers-persist-post-discharge/2016-05-02?

FUNDING

EXTRAMURAL Funding

Research Extramural Funding – Current

4/1/14 – 3/31/19 Older Adult Safety While Receiving Home Health Services after Hospital Discharge

1K08HS022916-01
Agency for Health Care Research and Quality
K08 Mentored Career Development Award
$891,988.96

Role: Principal Investigator, 75% effort

1/1/16 – 12/31/16 Mobile Acute Care Team Services: Outcomes, Training and Dissemination of Hospital at Home in Fee-for-Service Medicare and Beyond
120480 (Grant #)
John A. Hartford Foundation
$35,735
PI: Leff B
Role: Co-investigator, 5% effort

Research Extramural Funding – Pending None

Research Extramural Funding – Previous

7/1/03 – 6/30/05 Robert Wood Johnson Clinical Scholars Program
047945
Robert Wood Johnson Foundation
$94,000
PI: Gordis L
Role: Research Post-doctoral Fellow

5/1/04 – 6/30/07 Training in Gerontological Health Services Research
5T32AG023485
National Institute on Aging
PI: Boult C
Role: Research Post-doctoral Fellow

7/1/05 – 6/30/07 National Institute on Aging
T32AG000120
$96,000
PI: Fedarko NS
Role: Research Post-doctoral Fellow

7/1/05 – 6/30/10 Guided Care: Integrating High Tech and High Touch
R01 HS014580-01A1
AHRQ/NIA/John A. Hartford Foundation
PI: Boult C
Role: Research Post-doctoral Fellow (7/1/05 – 6/30/07)

9/1/07 – 8/30/10 Johns Hopkins Geriatrics Floating Interdisciplinary Transitions Team
2005-05
John A. Hartford Foundation
$60,000
PI: Durso SC
Role: Co-PI: 20% effort

1/1/08 – 12/31/11 Investigating Systems and Aspects of Care to Improve the Care Transitions of Older Adults
63518
Harold Amos Medical Faculty Development Program
Robert Wood Johnson Foundation
$413,433
Role: Principal Investigator, 55% effort

7/1/08 – 12/31/12 Enhancing the Quality of Medical Home Services (Guided Care Study)
2008-0074
The John A Harford Foundation
$1,700,000
PI: Leff B
Role: Dissemination of results and technical assistance 10/1/10-12/31/12, 10% effort

9/1/10 – 8/31/11 Planning to Develop a Discharge Safety and Risk Mitigation Dashboard for Effective
12-month extension Enterprise-Wide Care Transitions at Discharge
R21 HS019519
Agency for Healthcare Research and Quality
$232,718
PI: Davis R
Role: Co-Principal Investigator, 20% effort

7/1/12 – 6/30/14 Identification and Validation of Risks to Patient Safety during Care Transitions of Older Adults Receiving Skilled Home Health Care Services after Hospital Discharge
National Patient Safety Foundation
$100,000
Role: Principal Investigator, 10% effort

5/16/12 – 6/30/14 Sanofi Aventis U.S Inc.
Lyxumia+ Lantus Co-Package Comprehension Study
$70,868
PI: Gurses AP
Role: Co-Investigator, 3% effort

Educational Extramural Funding – Current
6/1/05 – 5/31/20 Summer Research in Aging for Medical Students
T-35 AG026758
NIH
PI: Durso SC
Role: Mentor

Educational Extramural Funding – Pending None

Educational Extramural Funding – Previous

6/1/04 – 5/30/10 Summer Research in Aging for Medical Students
T-35 AG026758
NIH
PI: Durso SC
Role: Mentor

9/1/04 – 4/30/11 Reynolds Consortium to Strengthen Family Expertise in Geriatrics in US Academic Health Centers
245-20026
Donald W. Reynolds Foundation
$2,500,000
PI: Durso SC
Role: Investigator/Instruction, 10% effort

7/1/07 – 6/30/15 Maryland Regional Interdisciplinary Geriatrics Training Program for Physicians, Dentists, and Behavioral and Mental Health Professions
5D01HP08789
HRSA
$501,544
PI: Durso SC
Role: Co-Investigator, 7.5% effort

7/1/07 – 6/30/12 Center of Excellence (CoE)
2005-0055
John A. Hartford Foundation
$100,000
PI: Durso SC
Role: Scholar

5/1/08 – 2/28/15 Translational Research Training in Gerontology & Geriatrics
5T32 AG000120
NIH
PI: Fedarko NS
Role: Mentor

Clinical Extramural Funding None

System Innovation or Quality Improvement Extramural Funding None

Other Extramural Funding None

INTRAMURAL Funding

Research Intramural Funding – Current

Continuous iHopes Designated Account (Secunda Family Gift)

80019167 (IO #)
Secunda Family Foundation
Total direct cost: N/A
PI: N/A
Role: Co-investigator, 17% effort (Cost Sharing with K Award)

Research Intramural Funding – Pending None

Research Intramural Funding – Previous:

10/1/13 – 3/31/14 Johns Hopkins Clinical Research Scholars Program
National Center for Advancing Transitional Sciences
1KL2TR001077
$98,288
Principal Investigator: Ford D
Role: Scholar, 80% effort

3/1/14 – 2/28/15 Center for Innovative Care in Aging, Johns Hopkins University School of Nursing

Creating a Real-Time Dashboard to Reduce Safety Risks for Older Adults Transitioning from the Hospital to Receiving Skilled Home Care Services
$4,975
Role: Principal Investigator

Educational Intramural Funding None

Clinical Intramural Funding None

System Innovation or Quality Improvement Intramural Funding None

Other Intramural Funding None

CLINICAL ACTIVITIES

Clinical Focus

My clinical focus is on the management of a broad range of older adults' clinical conditions across the continuum of care, with a particular focus on care coordination during transitions among acute inpatient, subacute rehabilitation, ambulatory, and home care settings.

Certification

Medical, other state/government licensure

2004 – present Maryland Medical License #D0060014

2004 – present Controlled Dangerous Substance License

2004 – present Drug Enforcement Association license

Boards, other specialty certification

2003, 2015 (recertification)	American Board of Internal Medicine #218881
2008 - present	American Board of Internal Medicine, sub-board of Geriatric Medicine

Clinical (Service) Responsibilities

2007 – 2008	Keswick inpatient rehabilitation unit, attending, as needed
2007 – present	Aliki Initiative general medicine inpatient service, attending, 2-6 weeks/year
2007 – present	General medicine inpatient service, attending, 2 weeks/year
2007 – 2014	Terrace inpatient rehabilitation unit, attending, 4-14 weeks/year
2007 – present	Peri-operative geriatric consultation service, attending, 2 weeks/year
2007 – present	On call pool, attending, as needed
2008 – present	Plaza ventilator unit, attending, as needed
2009 – present	Medical Behavioral Unit (formerly known as the Lakeside Acute Medical Psychiatry Unit), attending, as needed
2010 – present	Beacham Ambulatory Geriatric Care Center, preceptor, as needed
2014 – present	Elder House Call Program, physician house call program, attending, as needed

Clinical Productivity

Average annual number of patients evaluated or treated across the continuum of care, at 20% clinical effort: 320

Clinical Draw from outside local/regional area

Not applicable (primarily inpatient-based practice)

Membership in or examiner for specialty board None

Clinical Program Building/Leadership None

Clinical Demonstration Activities None

Development of nationally/internationally recognized clinical standard of care None

EDUCATIONAL ACTIVITIES

Educational Focus

My educational focus is on teaching a diverse audience of learners about the special needs of older adults, with a particular focus on ensuring high quality care during older adults' transitions across care settings, as informed by my research activities. I also speak about professional and career development issues, such as grant writing, preparing scientific presentations, and job negotiation. The diverse audience of learners includes students and clinical trainees across the schools of public health, nursing, and medicine.

Teaching

Classroom Instruction

JHMI/Regional

The Johns Hopkins University School of Medicine

2004	Group leader for 2nd year medical students, Physician and Society
2004 – 2005	Group leader for 2nd-year medical students, An Integrated Medical Encounter
2008 – present	Invited lecturer, post-doctoral clinical and research fellows, "Transitional Care," Geriatric Fellows' Core Curriculum, Division of Geriatric Medicine and Gerontology
2009 – 2010	Group leader for 2nd-year medical students, Geriatric Pathophysiology
2009 – present	Invited lecturer, post-doctoral clinical and research fellows, "Pearls for Pristine Posters: A Guide to Effective Poster Presentations," Geriatric Fellows' Professional Development Series, Division of Geriatric Medicine and Gerontology
2009	Invited lecturer, internal medicine residents, "Dealing with Death in the Hospital," Bayview Residency Program in Internal Medicine, Department of Medicine
2010	Invited lecturer, surgery residents, "Older Patients Undergoing Surgery," Geriatrics for Surgeons, Department of Surgery

2011	Invited lecturer for 3rd and 4th year medical students, "Polypharmacy: Strategies for Managing Medications in Your Older Patients," Chronic Disease and Disability Clerkship
2011 – present	Invited lecturer and facilitator, pre-doctoral medical students and post-doctoral clinical and research fellows, "Hospital and Transitional Care," Health Services Orientation Series, Division of Geriatric Medicine and Gerontology
2013	Invited faculty, internal medicine residents, "Taking a Leap and Finding an Authentic Path: Reflections from Working with the Media to Improve Health Care for Older Adults," Medicine for the Greater Good Curriculum—Health Promotion, Bayview Residency Program in Internal Medicine
2013 – present	Invited lecturer, medical students, "Making the Most out of Attending Scientific Meetings," Medical Student Training in Aging Research Program, Division of Geriatric Medicine and Gerontology
2014	Invited lecturer, post-doctoral clinical and research fellows, "Care Transitions in Older Adults," Bayview Geriatric Psychiatry and Neuropsychiatry Curriculum, Division of Geriatric Psychiatry and Neuropsychiatry, Department of Psychiatry
2015	Invited lecturer, post-doctoral clinical and research fellows, "Cultural Competence in End-of-Life Care," Bayview Geriatric Psychiatry and Neuropsychiatry Curriculum, Division of Geriatric Psychiatry and Neuropsychiatry, Department of Psychiatry

The Johns Hopkins University Bloomberg School of Public Health

2004 – present	Invited lecturer for undergraduate and graduate students, "Transitional Care," HPM 309.687.81 course titled Innovations in Health Care for Aging Populations, Department of Health Policy and Management

The Johns Hopkins University School of Nursing

2013 – present	Invited lecturer for Adult/Geriatric-Acute Care Nurse Practitioner students' geriatrics curriculum, "Issues for Acute Care Nurse Practitioners related to Transitions of Care for Older Adults"

National

2006	Invited lecturer for 2nd-year medical students, Introduction to Health Care II, Department of Family Medicine, Georgetown University School of Medicine, Washington, DC

International	None
Clinical Instruction	
JHMI/Regional	
2007 – present	Aliki Faculty attending, 3rd and 4th year medical students, sub-interns, pharmacy students, chaplaincy residents, nursing students, internal medicine residents, Aliki Initiative general medicine inpatient service, attending, 2-4 weeks/year, Johns Hopkins Bayview Medical Center
2007 – present	Attending**,** 3rd and 4th year medical students, sub-interns, pharmacy students, nursing students, internal medicine residents, General medicine inpatient service, 2 weeks/year, Johns Hopkins Bayview Medical Center
2007 – 2014	Attending, nurse practitioners, physician assistants, nurses, physical and occupational therapists, social workers, Terrace inpatient rehabilitation unit, attending, 4-14 weeks/year, John R. Burton Geriatric Care Center, Johns Hopkins Bayview Medical Center
2007 – present	Attending, geriatric medicine fellows, orthopedic residents, nurse practitioners, physician assistants, Peri-operative geriatric consultation service, 2 weeks/year, Johns Hopkins Bayview Medical Center
2007 – present	Attending, geriatric medicine post-doctoral fellows, nurse practitioners, physician assistants**,** On call pool, as needed
2009 – present	Attending, nurse practitioners, Medical Behavioral Unit (formerly known as the Lakeside Acute Medical Psychiatry Unit), as needed, Specialty Hospital, Johns Hopkins Bayview Medical Center
2010 – present	Faculty preceptor, geriatric medicine post-doctoral fellows, Beacham Ambulatory Geriatric Care Center, as needed, Johns Hopkins Bayview Medical Center
2014 – present	Faculty preceptor, geriatric medicine post-doctoral fellows, internal medicine residents, nurse practitioners, nurses, Elder House Call Program, physician house call program
National	None
International	None
CME Instruction	
JHMI/Regional	
9/09, 9/10, 9/11	Speaker, physicians, “Practical Solutions for Improving Care Transitions for Older Adults,” Geriatrics Mini-Fellowship Program, Baltimore, MD

2/10, 2/12	Speaker, physicians, nurse practitioners, physician assistants, nurses, geriatric medicine post-doctoral fellows, internal medicine residents, "Across the Health Care System: Practical Approaches to Better Transitions," Annual Edmund G. Beacham Current Topics in Geriatrics Course, Baltimore, MD
4/12	Speaker, nurses, nurse practitioners, "Polypharmacy: Strategies for Managing Medications in your Older Patients," 27th Semi-Annual Geriatric Symposium, Johns Hopkins Geriatric Education Center Consortium, Easton, MD
12/12	Speaker, physicians, "Ask the Expert in Geriatrics," The Johns Hopkins University School of Medicine/Harvard Medical School Continuing Education Course (Current Clinical Issues in Primary Care) at Pri-Med, Baltimore, MD
2/13	Speaker, physicians, nurse practitioners, physician assistants, nurses, geriatric medicine post-doctoral fellows, internal medicine residents, "Transitional Care 2.0: A Broader Approach to Improving Care Transitions for Older Adults," 38th Annual Edmund G. Beacham Current Topics in Geriatrics Course, Baltimore, MD
2/14, 2/15	Speaker, physicians, nurse practitioners, physician assistants, nurses, geriatric medicine post-doctoral fellows, internal medicine residents, "Cultural Competence in End-of-Life Care," Annual Edmund G. Beacham Current Topics in Geriatrics Course, Baltimore, MD
National	
3/12, 11/15	Co-organizer and speaker, physicians, post-doctoral fellows, Donald W. Reynolds Geriatrics Mini-Fellowship Training Program, Florida International University, Miami, FL
7/13, 3/16	Speaker and developer of teaching slides, geriatric medicine practitioners, "Transitions of Care" for the Geriatric Review Syllabus Audio Companion. American Geriatrics Society, NY. http://www.geriatricscareonline.org/
6/15	Speaker, physicians, nurse practitioners, physician assistants, nurses, case managers, social workers, "Bridging the Gaps: Transition of Care for the Older Adult," live webcast for OptumHealth Education.
International	None

Workshops / Seminars

JHMI/Regional

2008	Speaker, post-doctoral general medicine fellows, "Job Negotiation Skills for Junior Faculty," Division of General Internal Medicine, Baltimore, MD
2011 – 2013	Invited speaker, School of Medicine post-doctoral fellows, Bi-Annual Course on Research Leadership, "Strategies for a Successful Job Search and Negotiation," Professional Development Office, Johns Hopkins Medical Institutions, Baltimore, MD
2013 – present	Speaker, faculty and post-doctoral fellows, of the School of Medicine, "Benefits of Participating in Writing Accountability Groups," Office of Faculty Development, Baltimore, MD
2014 – present	Invited panelist, faculty and post-doctoral fellows of the School of Medicine, "Obtaining a K Award," Office of Faculty Development, Baltimore, MD
National	None
International	None

Mentoring

Pre-doctoral Advisees /Mentees

2007 – 2009 Karen Chen, BA, undergraduate student, currently attending Montclair State University to complete prerequisites to attend veterinarian school, Montclair, NJ.

Project: Evaluation of discharge summary quality during transitions of older adults

- Oral/Podium Presentation (Abstracts) No. 16

2007 – 2009 David Maron, MPH, graduate student, currently PhD candidate, Clinical Psychology, Catholic University of America, Washington, DC and statistician, Department of Veterans Affairs, Washington, DC.

Project: Evaluation of the Geriatric Floating Interdisciplinary Transitions Team

- Co-authored article OR 3
- Oral/Podium Presentation (Abstracts) Nos. 8, 12

2007 – 2009 Ivana Vaughn, MPH, currently PhD candidate and Graduate Research Assistant, Department of Health Services Research, Management and Policy, University of Florida College of Public Health and Health Professions, Gainesville, FL.

Project: The impact of acute care process on transitions of care of older adults

- Poster Presentation No. 11, American Geriatrics Society Presidential Poster Finalist
- Oral/Podium Presentation (Abstracts) Nos. 16

2008 – 2009 Alison Newcomer, MHS, Research Associate, currently PhD candidate, Clinical Psychology, Catholic University of America, Washington, DC.

Project: Perspectives on pay-for-performance strategies for transitional care of older adults

- Co-authored article OR 8
- Oral/Podium Presentation (Abstracts) Nos. 10, 11

2008 – 2010 Masayo Sato, PhD, MS, graduate student, currently Research Scientist, Health Outcome Research, Eli Lilly Japan Co., Ltd., Japan.

Project: Residential and acute care transition patterns in a national sample of older adults

- Co-authored article OR 5

2009 – 2010 Susannah Cafardi, MPH, LCSW, MSW, graduate student, currently Social Science Research Analyst, Centers for Medicare and Medicaid Services, Baltimore, MD.

Project: The impact of social work services on hospital readmissions in older adults and characteristics of hospitals with social work

2009 – 2010 Karina Janicka Newhall, MD, medical student, currently Resident in Surgery, Dartmouth-Hitchcock Medical Center, Lebanon, NH.

Project: Nationwide distribution of hospital services for older adults

- Poster No. 13, American Geriatrics Society Presidential Poster Finalist
- Co-authored article OR 10

2013 – present Seema Malkana, DO, medical student, currently a Resident at Rowan University School of Osteopathic Medicine, Stratford, NJ.

Project: Medication management during transitions of care of older adults

- Poster Presentation Nos. 21, 22
- Werner NE, Malkana S, Gurses AP, Leff B, **Arbaje AI**. Medication management challenges among older adults receiving skilled home healthcare services after hospital discharge: Human factors engineering approach *(under review)*

2013 – present Nicole Werner, PhD, Senior Research Analyst, currently Assistant Professor, Department of Industrial and Systems Engineering; Affiliate Faculty, Center for Quality and Productivity Improvement, College of Engineering; Discovery Fellow, Living Environments Laboratory, Wisconsin Institute for Discovery, University of Wisconsin-Madison, Madison, WI; Affiliate Faculty, Geriatric Research Education and Clinical Center, William S. Middleton Memorial Veterans Hospital.

Project: Patient safety of older adults receiving skilled home health care after hospital discharge.

- Co-authored articles OR 11 – 13, 15
- Poster presentation Nos. 20 – 27
- American Geriatrics Society Presidential Poster Finalist
- Oral/Podium Presentation (Abstracts) Nos. 18 – 25.
- Werner NE, Malkana S, Gurses AP, Leff B, **Arbaje AI**. A Process-Based Approach to Studying Work across System Boundaries. (*under review*)

2014 – present Elaine Nguyen, BA, medical student, currently medical student, University of Texas Southwestern Medical School, Dallas, TX.

Project: Identifying physician communication of challenges during care transitions older adults.

- Poster presentation No. 24, American Geriatrics Society Presidential Poster Finalist

2014 – present Lubna Refai, MPH, MPH Capstone Advisee, currently Implementation Coordinator at Doctella, Columbia, MD.

Project: The Acute Care for Elders model and its impact on acute care in hospitals.

2015 – present Gayle Kricke, MSW, Research Assistant, currently doctoral candidate in the Health Sciences Integrated Program at Northwestern University Feinberg School of Medicine in Chicago, Illinois.

Project: The Association between Multiple Chronic Conditions, Care Coordination, and the Perception of High Quality End-of-Life Care for Older Adults

Grants: AHRQ R36 (No. R36HS024890), 9/30/2016 until 8/29/2017

- Kricke G, **Arbaje AI**, Woods D, Jordan N. Association between Presence of Multiple Chronic Conditions and the Experience of High-Quality End-Of-Life Care for Community-Dwelling Older Adults. (*under review*)

Post-doctoral Advisees /Mentees

2007 – 2010 Lauren Graham, MD, MHS**,** Internal Medicine Resident, currently Medicine Department Chief and practicing physician, Internal Medicine, Grinnell Regional Medical Center, Grinnell, IA. Also on the public health and epidemiology committee for the Grinnell Regional Medical Center / Poweshiek County Public Health Department.

Project: Risk of Hospital Readmission for Older Adults Discharged on Friday.

- Co-authored article OR 6
- Poster presentation No. 14

2008 Ben Tu, MD, Internal Medicine Resident, currently a General Internist in primary care, South Hills Family Medicine, Pittsburgh, PA.

Project: Transition of Care in a Complex Patient: The Benefit of a Thorough History and In-person Communication among Providers across Care Sites

- Poster presentation No. 9

2008 – 2013 Nancy Li Schoenborn, MD**,** Fellow, currently Assistant Professor, Geriatrics, Johns Hopkins University School of Medicine, Baltimore, MD.

Project: Clinician roles and responsibilities during care transitions of older adults

- Co-authored article OR 7
- Poster presentation No. 18
- Oral/Podium Presentation (Abstracts) Nos. 15

2010 – 2011 Laalitha V. Surapaneni, MBBS, MPH**,** Research Associate, currently practicing physician, Internal Medicine, Sanford Bemidji Medical Center, Bemidji, MN.

Projects: Higher Quality Discharge Summaries of Hospitalized Older Adults Are Associated with Reduced Risk of Readmission: Instrument Development and Outcomes. Use of malpractice claims to evaluate care transitions of older adults.

- Poster presentation No. 17, Society for General Internal Medicine poster award
- Oral/Podium Presentation (Abstracts) Nos. 16

2012 – present Mahiyar F. Nasarwanji, PhD, MS, BE, Research Fellow, currently Associate Research Fellow, National Institute for Occupational Safety and Health, Pittsburgh, PA.

Project: Patient safety during care transitions of older adults receiving skilled home healthcare after hospital discharge.

- Co-authored article OR 12
- Poster presentation Nos. 19, 20, 24, 26, American Geriatrics Society Presidential Poster Finalist
- Oral/Podium Presentation (Abstracts) Nos. 18, 20 – 22

2013 – present Ariel Green, MD, MPH, geriatrics fellow, currently Assistant Professor, Geriatrics, Johns Hopkins University School of Medicine, Baltimore, MD

Career development guidance and grant review

Grants: Johns Hopkins Clinical Research Scholars Award (KL2)

2014 – present Catherine Callister, MD, research advisor, currently Resident in Internal Medicine, Johns Hopkins Bayview Medical Center, Baltimore, MD.

Project: Identifying risks to older adults' safety during care transitions from hospital to home

- Poster presentation Nos. 25, 27, American Geriatrics Society Presidential Poster Finalist

2013 – present Evan Wong, MD, MPH, research advisor, currently general surgery resident and Critical care fellow, McGill University, Montreal, Quebec, Canada.

Project: Association of Severity of Illness and Intensive Care Unit Readmission: A Systematic Review.

- Co-authored article OR 14

2015 – present Sara Keller, MD, MPH, MSHP, research advisor, currently Assistant Professor, Division of Infectious Diseases, Johns Hopkins University School of Medicine, Baltimore, MD.

Project: Learning from the Patient: Human Factors Engineering in Outpatient Parenteral Antimicrobial Therapy.

- Co-authored article OR 15, RA 4

Thesis Committees

2009 Lauren Graham, "Risk of Hospital Readmission for Older Adults Discharged on Friday," research mentor

2010 Susannah Cafardi, "The impact of social work services on hospital readmissions in older adults and characteristics of hospitals with social work," research mentor

2015 Lubna Refai, "Impact of the Acute Care for Elderly model compared to acute care provided in conventional hospital units," thesis advisor

2015 Gayle Kricke, "The Association between Multiple Chronic Conditions, Care Coordination, and the Perception of High Quality End-of-Life Care for Older Adults," doctoral research advisor and dissertation committee member

Educational Program Building / Leadership

2005 – present Guided Care Study, Department of Health Policy and Management, Johns Hopkins Bloomberg School of Public Health. Responsible for development of content and evaluation materials for a lecture, taped seminar, case-based workshop and integrative practica, designed for use with information technology and distance education.

2005 – present Elder House Call Program, Division of Geriatric Medicine and Gerontology, Johns Hopkins University. Responsible for development of content and evaluation materials to teach internal medicine residents how to perform house calls. Materials include lectures, seminars, one-on-one precepting, and in-depth learner interviews.

Educational Demonstration Activities to external audiences None

RESEARCH ACTIVITIES

Research Focus

The unifying theme of my research is to improve patient safety by developing, evaluating, and disseminating best practices to deliver health care to older adults as they transition across healthcare settings. My research characterizes patient populations at risk of experiencing suboptimal care transitions, identifies processes related to successful transitions, and develops interventions to improve care transitions and reduce re-hospitalization. My work has elucidated (a) older adults' care transitions patterns, (b) the importance of home environments; (c) novel system-level risk factors for suboptimal care, and (d) risk factors to provide feedback to healthcare providers in real time before patient harm occurs.

Research Program Building / Leadership

Sep. 2007 – Present Director of Transitional Care Research, Johns Hopkins University School of Medicine. In my capacity, I am responsible for the following:

- Maintain forums for inter-professional academic partnership with other schools, departments, and institutions
- Participate in system innovation and quality improvement efforts within the Division and throughout JHMI
- Develop research priorities for NIH, AHRQ, non-profit foundations, and other grantmaking organizations.
- Advise healthcare organizations and payers on the development of measures to evaluate care transition quality.
- Develop position statements for specialty societies interested in improving care transitions.
- Enhance the diversity of transitional care researchers by conducting outreach to organizations advocating for the advancement of historically underrepresented or disadvantaged groups.
- Provide active mentorship to trainees (fellows, residents, medical/nursing/public health/engineering students), and other faculty.
- Enhance the awareness of Transitional Care Research and disseminate to scientific and non-scientific audiences via conferences, publications, and media outlets.

Research Demonstration Activities	None
Inventions, Patents, Copyrights	None
Technology Transfer Activities	None

SYSTEM INNOVATION AND QUALITY IMPROVEMENT ACTIVITIES

System Innovation Focus

I am interested in the problems older adults face as they navigate through the healthcare system. I am leading several studies that aim to develop performance measures, define best practices, and ultimately improve the quality of care of older adults as they leave the hospital. The focus of my

research activities has been on identifying patient populations at risk of experiencing suboptimal care transitions, identifying care processes and hospital characteristics related to readmissions, and developing clinical interventions to improve care transitions and reduce hospital readmissions.

System Innovation and Quality Improvement Efforts within JHMI:

- Membership on JHMI Readmissions Task Force, Subcommittee on Care Transitions
- Collaboration with Armstrong Institute for Patient Safety and Quality to develop research working groups on improving transitions for those with complex needs
- Collaboration with the Center on Innovation and Quality Patient Care to develop effective enterprise-wide care transitions at discharge for JHMI
- Leadership of Individualized Hospital-Outpatient Post-discharge Education and Support (iHOPES) platform development group initiative to improve transitions to and from the John R. Burton Care Center (now Specialty Hospitals), including the supervision of collection and reporting of quality data to Care Center leadership
- Facilitate models of care that improve care transitions to Johns Hopkins Home Care Group
- Refinement of Aliki Initiative curriculum to improve transitions to and from JH Bayview Medical Center
- Member of JH Aging Services Portfolio – assist with development of commercialization strategies
- Member of the Coordinating Council of the Office of Home Based Services (HBS) sanctioned by JHM 3.0. The Office provides a forum to coordinate home based services across JHM. The goal of The Office is to establish common definitions, align resources, build capacity, and foster collaboration and innovation.

System Innovation and Quality Improvement Efforts outside of JHMI: None

System Innovation and Quality Improvement Program Building / Leadership: None

ORGANIZATIONAL ACTIVITIES

Institutional Administrative Appointments

2008 – present	Member, Diversity Council, Department of Medicine, Johns Hopkins University School of Medicine. Participated in activities to promote increased recruitment, retention and advancement of faculty, fellow and residents from minority or other disadvantaged groups, including participation in annual divisional reviews across the Department of Medicine.
2009 – present	Founding Member, Hopkins Organization for Latino Awareness (HOLA), now part of Centro Sol (see below), Johns Hopkins University School of Medicine.
2010 – present	Member, Mosaic Initiative to Enhance Diversity, Division of Geriatric Medicine and Gerontology. Lead efforts to enhance recruitment and retention of learners from underrepresented groups. Facilitate "lunch

	and learn" series with faculty, fellows, and staff across the Division to discuss issues of diversity and promote a culture of inclusion.
2010 – present	Member, Selection Committee for American Federation for Aging Research Medical Student Training in Aging Research (MSTAR) program, Division of Geriatric Medicine and Gerontology. Lead efforts to recruit and mentor students from underrepresented groups.
2013 – present	Member, Center for Salúd/Health and Opportunity for Latinos (Centro Sol), Johns Hopkins University. Lead an effort to partner post-doctoral fellows with older Latinos in the community and provide health education. Coordinate efforts for media outreach to the local and national Latino population. Create partnerships with local STEM programs for high school students to discover careers in aging.
2015 – present	Faculty Advisory Committee member, Johns Hopkins annual conference on women's health called *A Woman's Journey.* Advise the committee on the presentation of emerging topics in the field of aging.
2016 – present	Core faculty, Armstrong Institute for Patient Safety and Quality

Editorial Activities

Editorial Board Appointments None

Journal Peer Review Activities

2004 – present	*Journal of General Internal Medicine*
2004 – present	*Journal of the American Geriatrics Society*
2009 – present	*The Gerontologist*
2012 – present	*International Journal for Quality in Health Care*
2012 – present	*Joint Commission Journal on Quality and Patient Safety*
2013 – present	*Journal of Hospital Medicine*
2015 – present	*Medical Care*
2016 – present	*Annals of Internal Medicine*

Other peer review activities None

Advisory Committees, Review Groups/Study Sections

2004 – present	Member**,** Diversity Network, Harvard School of Public Health
2006 – present	Ambassador, Robert Wood Johnson Clinical Scholars Program, National Office. Encourage house staff from all disciplines to consider research training through the Robert Wood Johnson Clinical Scholars Program.
12/08	Invited member, "Improving Safe Transitions for Medicare Beneficiaries" Technical Expert Panel, Centers for Medicare and Medicaid Services (CMS)
9/09	Invited member, CMS "Care Transition Measure Development" Technical Expert Panel
9/10	Invited member, Work Group on Care Transitions, National Heart, Lung, and Blood Institute (NHLBI)
9/10	Invited participant, Gerontological Society of America Summit on Diffusing Care Coordination Models and Translating Research into Policy and Practice
5/11	Section author, American College of Physicians PACT initiative (Physicians and Providers Advancing Care Transitions)
2012 – present	Member, Public Education Committee, American Geriatrics Society
2012 – present	Member, Advisory Board for the Gordon and Betty Moore Foundation collaboration with the Johns Hopkins Armstrong Institute for Patient Safety
2012 – present	Robert Wood Johnson Harold Amos Medical Faculty Development Program, National Office. Serve as an ambassador for the program to encourage fellows and junior faculty to apply for the mentored funding award.
2013	Member, Care Coordination for Patients Discharged from the Emergency Department Subject Matter Expert Work Group, Mathematica Policy Research, Inc.
2014 – present	Member, Advisory Board, Johns Hopkins University Office of Women in Science and Medicine
2014 – present	Member, Selection Committee for The Mason F. Lord Staff Award of Excellence, Johns Hopkins University School of Medicine.
2014	Reviewer, Pyramid Service Grants Leadership Team, Johns Hopkins University School of Medicine
2015	Member, Society for General Internal Medicine (SGIM) Work Group on Creating Educational Best-Practice Guidelines for the Care of

	Seniors Transitioning from Skilled Nursing Facilities to Outpatient Primary Care
2015 – 2016	Ad hoc member, Health Care Research Training (HCRT) Study Section, Agency for Healthcare Research and Quality, Department of Health and Human Services
2016 – present	Standing member, Health Care Research Training (HCRT) Study Section, Agency for Healthcare Research and Quality, Department of Health and Human Services

Professional Societies

2000 – present	Member, Alpha Omega Alpha Medical Honor Society
2000 – present	Member, Association of Yale Alumni in Medicine
2004 – present	Member, American Geriatrics Society
2004 – present	Member, Society of General Internal Medicine
2004 – present	Member, Academy Health
2005 – present	Member, Gerontological Society of America

Conference Organizer

JHMI/Regional	
2015 – present	Faculty Advisory Committee, Johns Hopkins annual conference on women's health called *A Woman's Journey*
National	None
International	
2010, 2011, 2012	Chairperson, *1st, 2nd, and 3rd Annual World Health Care Congress Leadership Summit on Hospital Re-Admissions: Best Practices for Implementing Transitional Care Models.* National Harbor, MD.

Session Chair

JHMI/Regional	None
National	
2006	Co-Chair, symposium entitled "Improving the Care of Older Adults as They Transition across Health Care Settings." *Annual Scientific Meeting of the Gerontological Society of America*, Dallas, TX.
2015	Chair, symposium entitled, "Advancing efforts toward improving care transitions of older adults across healthcare settings." *Gerontological Society of America's Annual Scientific Meeting,* Orlando, FL.

International	None
Consultantships	
2007 – present	WellPoint / Resolution Health, Inc. (RHI), faculty consultant on development of quality measures for the care of older adults
2008 – present	Research Triangle Institute International (RTI), consultant

RECOGNITION

Awards, Honors

1991	Valedictorian, Paola High School, Paola, Kansas
1994	Kansas Health Foundation Fellow**,** Centers for Disease Control and Prevention Work Group on Health Promotion and Community Development
1994	Outstanding Undergraduate Research Award**,** Department of Sociology, University of Kansas
1995	Hilltopper Award for Outstanding Leadership and Community Service**,** University of Kansas
1994, 1996	Rhodes Scholar National Finalist, University of Kansas
1998, 2002, 2003	Yale Johnson & Johnson Physician Scholar in International Health
2000	Alpha Omega Alpha**,** Yale University School of Medicine
2002, 2003	Research in Residency Program**,** Yale-New Haven Hospital
2004	Business of Medicine Scholarship**,** Johns Hopkins School of Professional Studies and Business Education
2005	Fellow, Grantmakers in Aging Fellow
2005, 2007, 2008, 2009, 2010, 2015, 2016	Presidential Poster Session Finalist, American Geriatrics Society, recognition given to abstracts receiving the highest scores during the peer review selections process for the national scientific meeting.
2008	New Investigator Award for Outstanding Research in Geriatrics, American Geriatrics Society
2009, 2010	Catch a Shining Star Award for Service Excellence, Johns Hopkins Medical Institutions
2009	Selected to AAMC Early Career Women Faculty Professional Development Program (148 selected out of 321 applicants)

2009	Selected to the technical expert panel sponsored by the Centers for Medicare and Medicaid Services to develop measures of re-hospitalization and physician follow up (22 selected out of over 150 applicants)
2011	Emerging Women's Leadership Program, Johns Hopkins University School of Medicine Office of Women in Science and Medicine
2012	MEDSURG Nursing Nurse Competence in Aging Writer's Award
2012	Selection as an Armstrong Scholar in Patient Safety
2012	Selection to Graduate Training Program in Clinical Investigation
2012	Alumni Honorary Medal, University of Kansas Honors Program
2014	Leadership Program for Women Faculty, Johns Hopkins University School of Medicine Office of Women in Science and Medicine
2014, 2015	Most highly rated speaker at the Johns Hopkins annual women's conference entitled *A Woman's Journey*
2015	Special Recognition Award for Outstanding Service on the AGS Public Education Committee
2016	Excellence in Teaching Award, Division of Geriatric Medicine and Gerontology, for superior contributions to the knowledge and expertise of the Post-Doctoral Fellows in the Geriatric Medicine and Gerontology Fellowship Program.
2016	Provost Diversity Recognition Award, Johns Hopkins Diversity Leadership Council, for outstanding accomplishments to foster greater appreciation, advancement and celebration of diversity and inclusion at Johns Hopkins.

Invited Talks, Panels

JHMI / Regional

1/05	Speaker, Lipitz Center Research Conference, "The Effects of Self-Management and Home Help on Medicare Beneficiaries' Use of Hospitals: Insights into Issues of Transitional Care," Johns Hopkins Bloomberg School of Public Health, Baltimore, MD
2/08	Panel member, American College of Physicians Annual Chapter Meeting, "Improving Care Transitions for Older Adults." Panel discussion entitled, "Transitions of Care: Who is dropping the Ball?" Baltimore, MD
7/08	Speaker, Johns Hopkins Division of Geriatric Medicine and Gerontology Grand Rounds, "Feasibility of a Pilot Intervention to Improve Care Transitions for Hospitalized Older adults: The Geriatric Floating Interdisciplinary Transitions Team," Baltimore, MD

10/08	Speaker, Johns Hopkins Hospital Department of Medicine Grand Rounds, "Creating a Geriatrics Center of Gravity around Hospitalized Older Adults: The Geriatric Floating Interdisciplinary Transitions Team," Baltimore, MD
12/08	Speaker, Johns Hopkins Division of Geriatric Medicine and Gerontology Grand Rounds, "Trends in the Proportion of Hospitals Offering Services for Older Adults: Which Ones Matter for Readmissions?" Baltimore, MD
10/13	Guest Speaker, Welch Center Grand Rounds, "Transitional Care 2.0: Broader Approaches to Improving Care Transitions of Older Adults after Hospital Discharge," Welch Center for Prevention, Epidemiology and Clinical Research, Johns Hopkins Medical Institutions, Baltimore, MD
4/14, 7/16	Speaker, "Inspiring Girls to STEM careers related to Aging," Johns Hopkins Centro SOL, Baltimore, MD

National

11/07	Speaker, Annual Scientific Meeting of the Gerontological Society of America in symposium entitled "Geri-FITT: An Intervention to Improve Hospital Care and Post-Hospital Transitions of Care," "Impact of Geri-FITT on Patient Satisfaction and Utilization during Care Transitions," San Francisco, CA
3/08	Speaker, Centers for Medicare and Medicaid Services, "The Early Effects on Hospital Readmission of the Guided Care 'Medical Home' for High-Risk Beneficiaries," Baltimore, MD
11/09	Keynote speaker, "Improving Care Transitions for Older Adults in the Hospital," Acute Care of Older Adults Conference, University of Wisconsin, Milwaukee, WI
12/09	Speaker, "Improving Care Transitions for Older Adults: Lessons Learned from Research," Centers for Medicare and Medicaid Services QualityNet Conference, Baltimore, MD
1/10	Speaker, "Measures to Rate the Quality of Care Transitions and Impact Re-Admissions: Lessons from Research," Annual World Health Care Congress Leadership Summit on Hospital Re-Admissions: Best Practices for Implementing Transitional Care Models, National Harbor, MD
4/10	Keynote Speaker, "Across the Health Care System: Practical Approaches to Better Transitions," First Annual Northwest Regional Geriatric Nursing Conference, University of Arkansas Medical System, Fayetteville, AR
4/10	Speaker, "Improving Older Adults' Care Transitions to Post-Acute Settings," symposium entitled, "Working Together: Improving

	Transitions of Care between the Inpatient and Ambulatory Settings." Society of General Internal Medicine Annual Meeting, Minneapolis, MN
9/10	Keynote speaker, "Across the Health Care System: Practical Approaches to Better Transitions for Older Adults," 30th Annual Aspirus Health System Primary Care Symposium Featuring Topics in Geriatrics, Wausau, WI
10/10	Workshop facilitator, "The Aging Brain: Maturity & Making Health Transitions," Robert Wood Johnson Foundation Local Funding Partnerships Annual Meeting, St. Paul, MN
11/10	Speaker, "The Guided Care Model," Gerontological Society of America Pre-Conference on Aging and Disability Resource Centers as Key Facilitators in Care Transitions, New Orleans, LA
1/11	Speaker, "Transitioning Older Adults across the Care Continuum," 2nd Annual World Health Care Congress Leadership Summit on Hospital Re-Admissions: Best Practices for Implementing Transitional Care Models, National Harbor, MD
3/11	Speaker, "Results from the Guided Care Medical Home," Third National Medical Home Summit, Philadelphia, PA
4/11	Speaker, "Medication Management for Older Adults: Moving Beyond Disease Management for the Primary Care Physician," American College of Physicians Annual Meeting, San Diego, CA
9/11	Speaker, "The Guided Care Medical Home: Primary Elder Care in a New Age," West Virginia Long-Term Care Partnership Summit, Charleston, W VA
11/11	Speaker, "Guided Care: a Model of Health Care for Older People with Multiple Chronic Conditions," American Board of Quality Assurance and Utilization Review Physicians 34th Annual Health Care Quality and Patient Safety Conference, San Antonio, TX
4/12	Speaker, "Guided Care: a Model of Health Care for Older People with Multiple Chronic Conditions," American Board of Quality Assurance and Utilization Review, Physicians 35th Annual Health Care Quality and Patient Safety Conference, Atlanta, GA
10/12	Speaker, "Improving Care Transitions for Older Adults: Designing system-level interventions that account for their special needs." Part of workshop, entitled "Using Human Factors and Systems Engineering to Improve Care Coordination." Human Factors and Ergonomics Society 56th Annual Meeting, Boston, MA
4/13	Speaker, "Preparing for Fellowship: Options for those interested in public health, policy, and leadership," National Hispanic Medical Association 16th Annual Conference, Washington, DC

5/14	Speaker, "Models for Improving Transitional Care," Geriatrics Consultative Medicine Special Interest Group, American Geriatrics Society 2014 Annual Scientific Meeting, National Harbor, MD
5/14	Speaker, "Messaging Geriatrics: Tools for Success and How to Use Them," American Geriatrics Society 2014 Annual Scientific Meeting, Orlando, FL
5/15	Speaker, "Messaging Geriatrics: Working with the Media," American Geriatrics Society 2015 Annual Scientific Meeting, National Harbor, MD
5/16	Symposium panelist, "Communicating about aging and geriatrics with the public, system leaders, colleagues and trainees." Symposium entitled, "Messaging Geriatrics: Lessons from the Frameworks Institute reports on Aging -- Effective New Ways to Talk to Patients, the Public, Colleagues, Trainees, and System Leaders" Annual Scientific Meeting of the American Geriatrics Society, Long Beach, CA
5/16	Symposium panelist, "Roadmap for Implementation of Best Practices for SNF to Primary Care Transitions." Symposium entitled "Recommendations of Best Practices for Successful Transition of Older Adults from Skilled Nursing Facility Care to Primary Care and Home," Annual Scientific Meeting of the American Geriatrics Society, Long Beach, CA

International

10/09	Keynote speaker, Spanish language, "Identification and management of common geriatric syndromes." Universidad de la Tercera Edad, Santo Domingo, Dominican Republic
8/11	Speaker, Spanish language, "Strategies for promoting healthy aging." Live Longer and Better Symposium, Fundación Santa Fe de Bogotá, Bogotá, Colombia
8/11	Speaker, Spanish language, "Management of medications in older adults," and "Falls in older adults." International Symposium of Geriatrics and Gerontology, Hospital Civil de Guadalajara, Guadalajara, Mexico
6/13	Speaker, "Care Transitions Programs in the United States: Common themes, lessons learned, and broader approaches for improving care," symposium entitled, "Transitions Programs: Perspectives from Three Continents." 20th International Association of Gerontology and Geriatrics World Congress. Seoul, Korea
8/13	Speaker, "Improving care transitions of older adults: Common approaches, lessons learned, and broader applications." 9th Annual

	Conference of the Australian Disease Management Association. Sydney, Australia
8/13	Keynote speaker, “Approaches to improving care transitions of older adults in the United States.” Integrated Chronic Disease Management forum, Victorian Department of Health, Melbourne, Australia
9/14	Speaker, “Identifying Information Management Challenges during Older Adults’ Transitions from Hospital to Home Care.” Chinese Congress on Gerontology and Health, Suzhou, China
	Speaker, “Learning from Lawsuits: Application of a Human Factors Engineering Approach to Investigate Hospital-to-Home Transitions using Malpractice Data.” Chinese Congress on Gerontology and Health, Suzhou, China
	Speaker, “Identifying Information Management Challenges faced by Home Healthcare Nurses Managing Older Adults’ Transitions from Hospital to Home Care.” Second International Home Care Nurses Organization Conference, Singapore, Singapore
1/16	Keynote speaker, Spanish language, “Strategies for Healthy Aging and Obtaining the Best Healthcare Possible,” Museo Memorial de la Resistencia Dominicana (Memorial Museum of Dominican Resistance), Santo Domingo, Dominican Republic

Dissemination to Lay Audiences

Conferences / Invited Talks

11/09	Speaker, "Medicine Cabinet: Managing Medications as you Get Older," Johns Hopkins Medicine: A Woman's Journey, Baltimore, MD
11/11	Speaker, "Medication Management as You Get Older," Johns Hopkins Medicine: A Woman's Journey, Baltimore, MD
8/12	Speaker, “What’s in Your Medicine Cabinet?,” Highmark Blue Shield: Fun, Fit & Fabulous Women’s Health Conference, Pittsburgh, PA
8/15	Speaker, “Healthcare Management Strategies for Older Adults,” Robb Report Health and Wellness Conference, Park City, UT
11/15	Speaker, “Five Strategies for Aging Well,” Johns Hopkins Medicine: A Woman's Journey, Baltimore, MD
4/16	Speaker, “Healthy Living for Older Adults,” Saul Ewing, LLC Women’s Health Conference, Baltimore, MD

5/16	Speaker, "Strategies for Living Well, Remaining Independent, and Obtaining the Best Healthcare Possible," BB&T Wealth Women's Event, Columbia, MD
6/16	Speaker, "Bridging the Gaps in Care: the Importance of Older Adults' Transitions across Healthcare Settings and the Latest Research to Improve Care Delivery," National Press Foundation: Aging and Retirement: Understanding Generational Changes, Washington, DC
11/16	Speaker, "Bridging the Gaps in Care: Coordinating Older Adults' Transitions across Healthcare Settings," Women in Government 7th Annual Healthcare Summit, Washington, DC
11/16	Speaker, "Wisdom of Aging: Living well as you age and obtaining the best healthcare possible." Johns Hopkins Medicine: A Woman's Journey, Baltimore, MD
1/17	Speaker, "Managing your Health as You Get Older: How to Obtain the Best Healthcare Possible." Johns Hopkins Medicine: A Woman's Journey, West Palm Beach, FL
2/17	Speaker, "Five Strategies for Aging Well," Johns Hopkins Medicine: A Woman's Journey, Saudi Arabia

Visiting Professorships

11/11	University of Wisconsin, Milwaukee, Wisconsin
	"Readmissions of Older Adults," Grand Rounds, Aurora Sinai Medical Center, and Grand Rounds, Aurora Advanced Healthcare, Milwaukee, WI
	"Navigating Older Adults' Transitions from Hospital to Home: Practical Steps for Homecare Providers," Aurora Visiting Nurse Association of Wisconsin, Milwaukee, WI
11/13	University of Calgary, Alberta, Canada
	"Managing complexity and multi-morbidity in older adults: Collaboration as the key to success," Geriatrics Update for Rural and Urban Primary Care: Challenges in Community Based Dementia Care
	"Transitional Care 2.0: Broader Approaches to Improving Care Transitions of Older Adults after Hospital Discharge." Grand Rounds, Department of Geriatric Medicine
11/13	Asahi General Hospital
	Daily teaching rounds with internal medicine residents.
	"Managing Medications in Older Adults." Grand Rounds, Department of Internal Medicine

5/17 (upcoming)	University of Toronto, Toronto, Canada
	Career development coaching and media training for post-doctoral fellows
	"Care Transitions Programs in the United States: Common themes, lessons learned, and broader approaches for improving care of older adults across the continuum of care," Grand Rounds, Sinai Health System and the University Health Network Hospitals
6/17 (upcoming)	University of New Mexico, Albuquerque, New Mexico
	"Transitional Care for Older Adults: Latest Research Identifying Risk Factors for Older Adults and the Health Systems that Care for Them." Grand Rounds, Department of Medicine

OTHER PROFESSIONAL ACCOMPLISHMENTS

Posters

1. **Arbaje AI,** Wolff J, Powe NR, Anderson GF, Boult CE. The Effects of Self-Management and Home Help on Medicare Beneficiaries' Use of Hospitals. *American Geriatrics Society Annual Scientific Meeting, Presidential Poster Session*, May 2005.
2. **Arbaje AI,** Wolff J, Powe NR, Anderson GF, Boult CE. The Effects of Self-Management and Home Help on Older Adults' Hospital Utilization Patterns. *Society for General Internal Medicine Annual Meeting*, May 2005.
3. **Arbaje AI,** Wolff J, Powe NR, Anderson GF, Boult CE. Home Environment and the Likelihood of Readmission among Community-Dwelling Medicare Beneficiaries. *American Geriatrics Society Annual Scientific Meeting,* May 2006.
4. Eubank KJ, **Arbaje AI,** Maynor KA, Carrese JA. Improving Transitional Care for Older Adults: Solutions Proposed by Providers from Multiple Disciplines. *Annual Scientific Meeting of the Gerontological Society of America*, November 2006.
5. Eubank KJ, **Arbaje AI,** Maynor KA, Carrese JA. Teaching Transitional Care: Approaches Proposed by Providers from Multiple Disciplines. *American Geriatrics Society Annual Scientific Meeting*, May 2007.
6. **Arbaje AI,** Maynor KA, Eubank KJ, Carrese JA. Home Health Care Professionals' Perspectives on the Quality of Their Communication with Physicians during Older Adults' Care Transitions from Hospital to Home. *American Geriatrics Society Annual Scientific Meeting, Presidential Poster Session*, May 2007.
7. **Arbaje AI,** Eubank KJ, Maynor KA, Carrese JA. Physician Perspectives on Communication Quality with Colleagues during Older Adults' Care Transitions from Hospital to Home. *Annual Scientific Meeting of the Gerontological Society of America*, November 2007.
8. Hayashi J, Phillips K, **Arbaje AI,** Sridharan A, Gajadhar R, Sisson S. Educational Outcomes of a House Call Curriculum for Internal Medicine Residents. *American Geriatrics Society Annual Scientific Meeting, Presidential Poster Session*, May 2008.
9. Tu B, **Arbaje AI.** Transition of Care in a Complex Patient: The Benefit of a Thorough History and In-person Communication among Providers across Care Sites. *American College of Physicians, Maryland Associates' Meeting*, May 2008.
10. **Arbaje AI**, Leff B. Concerning trends in the Proportion of Hospitals Offering Services for Older Adults. *American Geriatrics Society Annual Scientific Meeting, Presidential Poster Session*, April 2009.

11. Vaughn IA, **Arbaje AI**. Do Acute Care Processes Place Older Adults at Risk for Hospital Readmission? *American Geriatrics Society Annual Scientific Meeting, Presidential Poster Session*, April 2009.
12. Wendel VI, **Arbaje AI**, D Cayea, E Tanner S C Durso. Impact of Geriatric Education on Staff Nurses' Perceptions of Resource Availability to Care for Hospitalized Older Adults. *American Geriatrics Society Annual Scientific Meeting,* April 2009.
13. Janicka KA, Leff B, **Arbaje AI.** Redistribution of Hospital Services for Older Adults from 1999 to 2006. *American Geriatrics Society Annual Scientific Meeting, Presidential Poster Session*, April 2010.
14. Graham L, Leff B, **Arbaje AI.** Identifying Older Adults at Risk for Hospital Readmission. *Annual Scientific Meeting of the Gerontological Society of America*, November 2010.
15. **Arbaje AI,** Yu Q, Wang J, Leff B. Nationwide Patterns over Time of Hospital Services Relevant to Older Adults. *American Geriatrics Society Annual Scientific Meeting,* May 2011.
16. **Arbaje AI,** Yu Q, Wang J, Leff B. Characteristics of Medicare Beneficiaries Readmitted within 180 Days. *American Geriatrics Society Annual Scientific Meeting,* May 2011.
17. **Arbaje AI**, Boonyasai RT, Kasda E, Huynh M, Surapaneni L, Locke CF, Wu AW, Leff B, Paine LA, Demski R, Davis RO. Using Malpractice Claims to Develop a Patient Safety and Risk Mitigation Dashboard for Effective Care Transitions at Discharge, *Academy Health Annual Research Meeting,* June 2012.
18. Schoenborn NL, **Arbaje AI**, Maynor KA, Eubank KJ, Carrese JA. Clinician Roles and Responsibilities during Care Transitions of Older Adults, *Academy Health Annual Research Meeting,* June 2012.
19. **Arbaje AI**, Nasarwanji M, Leff B, Gurses, AP. Critical Tasks and Challenges Associated with Initiating Care Transitions for Hospitalized Patients Receiving Skilled Home Healthcare Services after Hospital Discharge, *Academy Health Annual Research Meeting,* June 2013.
20. **Arbaje AI,** Werner NE, Nasarwanji MF, Leff BA, Gurses AP. Evaluation of Healthcare Professionals' Information Management During Older Adults' Transitions From Hospital to Home Care, *Association for Clinical and Translational Science 2014 Meeting*, Washington, DC, April 2014.
21. Werner NE, Malkana S, Nasarwanji MF, Gurses AP, Leff B, **Arbaje AI**. Identifying medication management challenges during older adults' transitions from hospital to skilled home care: A Human Factors approach. *Gerontological Society of America 2014 Annual Meeting,* November 2014.
22. Werner NE, Gurses AP, Malkana S, Leff B, **Arbaje AI**. System-level barriers, outcomes and design implications for managing older adults' medications across transitions from the hospital to skilled home care. *2015 International Symposium on Human Factors and Ergonomics in Health Care*, April 2015.
23. **Arbaje AI,** Werner NE, Leff B, Gurses AP. How older adults' manage information across transitions from the hospital to skilled home care: The role of patients and their informal caregivers. *2015 International Symposium on Human Factors and Ergonomics in Health Care*, April 2015.
24. Nguyen ET, Werner NE, Nasarwanji MF, Gurses AP, Leff B, **Arbaje AI**. From hospital to skilled home health care: Identifying physician communication of challenges during care transitions older adults. *American Geriatrics Society Annual Scientific Meeting, Presidential Poster Session,* May 2015.
25. **Arbaje AI**, Werner NE, Callister C, Gurses, AP, Leff B. Identifying Risks to Older Adults' Safety during Hospital to Skilled Home Health Care Transitions: A Human Factors Engineering Approach. *American Geriatrics Society Annual Scientific Meeting, Presidential Poster Session*, May 2015.

26. **Arbaje AI**, Werner NE, Nasarwanji MF, Leff B, Gurses AP. Using a Human Factors approach to identify and categorize barriers to older adults' care transitions from the hospital to home care. *American Geriatrics Society Annual Conference*, May 2015.
27. **Arbaje AI,** Werner NE, Callister C, Leff B, Gurses AP. Identifying Risks to Older Adults' Safety during Hospital to Skilled Home Health Care Transitions: A Human Factors Engineering Approach. *Academy Health Annual Research Meeting*, 2015.
28. Brody AA, **Arbaje AI**, Soones TN, Federman A, DeCherrie LV, Leff B, Siu A. Development and Implementation of the Mobile Acute Care Team Hospital at Home Program. *American Geriatrics Society Annual Scientific Meeting, Presidential Poster Session*, May 2016.

Oral/Podium Presentations (Abstracts)

1. **Arbaje AI,** Evans D. Health Care Rationing, Hierarchies of Expendability, and the Moral Order.
   Postgraduate Symposium on Medicine and Religion, University of Kansas Medical Center, Kansas City, KS, 1994.

   Western Social Science Association Regional Conference, Albuquerque, NM, 1994.

   Mid-America Congress on Aging, Kansas City, MO, 1994.

2. **Arbaje AI.** Management of Type II Diabetes Mellitus in Native American Populations: An Update of Dietary and Pharmacologic Strategies. *Fort Yuma Indian Hospital*, Yuma, AZ, 1998.
3. **Arbaje AI,** Morris V, Inouye SK. Using an Electronic Reminder to Improve Physician Practices at Yale-New Haven Hospital. *Research in Residency Honors Presentation, Yale-New Haven Hospital*, New Haven, CT, 2003.
   Publication: **Arbaje, AI,** "Using an Electronic Reminder to Improve Physician Practices at Yale-New Haven Hospital" (2000). Yale Medicine, Thesis Digital Library. Paper 482.

4. **Arbaje AI,** Wolff J, Powe NR, Anderson GF, Boult CE. Preventing Readmissions of Older Adults in the Community: The Influence of Hospital Care Coordination Structures and Assistance at Home. *National Meeting of the Robert Wood Johnson Clinical Scholars Program*, Orlando, FL, November 2004.
5. **Arbaje AI.** Coordinating the Movement of Patients across Service Sites: A Research Agenda. *Grantmakers in Aging Annual Meeting,* Baltimore, MD, October 2005.
6. **Arbaje AI,** Maynor KA, Eubank KJ, Carrese JA. Physician Perspectives on Pay-for-Performance Measures for Transitional Care. *National Meeting of the Robert Wood Johnson Clinical Scholars Program*, San Diego, CA, November 2006.
7. **Arbaje AI,** Wolff J, Powe NR, Anderson GF, Boult CE. Identifying Circumstances that Place Patients at Risk for Complicated Transitions. Co-Chair of symposium entitled "Improving the Care of Older Adults as They Transition across Health Care Settings." *The Gerontologist* 2006 (46); Special Issue I: 1-608
8. **Arbaje AI,** Eubank KJ, Maron DD, Durso SC. Impact of Geri-FITT on Patient Satisfaction and Utilization during Care Transitions. Participant in symposium entitled "Geri-FITT: An Intervention to Improve Hospital Care and Post-Hospital Transitions of Care." *The Gerontologist* 2007 (47); Special Issue II: 1-839
9. **Arbaje AI,** Wolff J, Yu Q, Powe NR, Anderson GF, Boult CE. Post-Discharge Environmental and Socioeconomic Factors and the Likelihood of Early Hospital Readmission

among Community-Dwelling Medicare Beneficiaries. *Journal of the American Geriatrics Society* 2008 (56); s1:1-211

10. Duhaney RL, **Arbaje AI,** Newcomer AR, Eubank KJ, Maynor KA, Carrese JA. Physician Perspectives on the Quality of Communication with their Colleagues during Patients' Care Transitions from the Hospital to Home: Implications for Pay-for-Performance. *American College of Physicians, Maryland Associates' Meeting*, May 2008.
11. **Arbaje AI,** Newcomer AR, Maynor KA, Duhaney RL, Eubank KJ; Carrese JA. Physician Perspectives on Important Communication Targets to Improve Care Transitions: Implications for Pay-for-Performance. *The Gerontologist* 2008 (48); Special Issue III: 1-770
12. **Arbaje AI,** Maron DD, Yu Q, Wendel VI, Tanner E, Boult CE, Durso SC. Evaluation of an Intervention to Improve Care Transitions for Hospitalized Older Adults: The Geriatric Floating Interdisciplinary Transitions Team (Geri-FITT). *The Gerontologist* 2008 (48); Special Issue III: 1-770
13. **Arbaje AI.** Improving Older Adults' Care Transitions to Post-Acute Settings. Participant in symposium entitled, "Working Together: Improving Transitions of Care between the Inpatient and Ambulatory Settings. *Society of General Internal Medicine Annual Meeting,* Minneapolis, MN, April 2010.
14. **Arbaje AI,** Yu Q, Leff B. Classification and Distribution of Services for Older Adults in US Hospitals over Time. *The Gerontologist* 2010 (50); s1: 1-550
15. Schoenborn NL, **Arbaje AI**, Maynor KA, Eubank KJ, Carrese JA. Clinician Roles and Responsibilities during Care Transitions of Older Adults, *Society of General Internal Medicine Annual Meeting,* May 2011.
16. **Arbaje AI,** Surapaneni L, Chen K, Vaughn I, Eubank K, Leff B. Higher Quality Discharge Summaries of Hospitalized Older Adults Are Associated with Reduced Risk of Readmission: Instrument Development and Outcomes. *Abstr AcademyHealth Meet*. 2011; 163.
17. **Arbaje AI.** Improving Care Transitions for Older Adults: Designing system-level interventions that account for their special needs. Part of workshop, entitled "Using Human Factors and Systems Engineering to Improve Care Coordination." *Proceedings of the Human Factors and Ergonomics Society 56th Annual Meeting* September 2012; (56);1:855-859
18. **Arbaje AI,** Werner NE, Nasarwanji MF, Gurses AP, Leff B. Identifying Information Management Challenges during Older Adults' Transitions from Hospital to Home Care. *Journal of the American Geriatrics Society* 2014 (62); s2:S396-S401 *[presented by Dr. Werner]*
19. **Arbaje AI,** Werner NE, Kasda E, Wu AW, Leff B, Boonyasai R. Learning from Lawsuits: Application of a Human Factors Engineering Approach to Investigate Hospital-to-Home Transitions using Malpractice Data. *Journal of the American Geriatrics Society* 2014 (62); s2:S396-S401
20. **Arbaje AI**, Werner NE, Nasarwanji MF, Gurses AP, Leff B, Tanner EK. Identifying Information Management Challenges faced by Home Healthcare Nurses Managing Older Adults' Transitions from Hospital to Home Care. *Second International Home Care Nurses Organization Conference*, Singapore, September 2014.
21. **Arbaje AI**, Werner NE, Nasarwanji MF, Leff B, Gurses AP. Learning from lawsuits: Application of a Human Factors engineering approach to investigate hospital-to-home care transitions using malpractice data. *Journal of American Geriatrics Society* 2014 (62); s2: s357
22. **Arbaje AI**, Werner NE, Nasarwanji MF, Leff B, Gurses, AP (2014). Identifying information management challenges during older adult's transitions from the hospital to home care. *Journal of American Geriatrics Society* 2014 (62); s2; s358
23. Werner NE, Gurses AP, Leff B, **Arbaje AI**. Identifying and Prioritizing Barriers to Older Adults' Safe Hospital to Home Care Transitions. Chair of symposium entitled, "Advancing

Efforts toward Improving Care Transitions of Older Adults across Healthcare Settings." *The Gerontologist* 2015 (55): Suppl 2: 792

24. Werner NE, Leff B, Gurses AP, **Arbaje AI.** Performance shaping factors in home health care: Perspectives of home healthcare providers transitioning older adults to home health services. *International Symposium on Human Factors and Ergonomics in Health Care*, San Diego, CA, 2016. *[presented by Dr. Werner]* http://submissions.mirasmart.com/hcs2016/Itinerary/

25. Werner NE, Leff B, Gurses AP, **Arbaje AI.** Older Adults' Transitions of Care from Hospital to Home. Chair of symposium entitled, "Conceptualizing Sociotechnical System Boundaries in Healthcare Settings: Within and Across Teams, Organizations, Processes, and Networks." *International Annual Meeting of the Human Factors and Ergonomics Society*, Washington, DC, September 2016. *[presented by Dr. Werner]*

Community Services

2013 – present	Member, Center for Salúd/Health and Opportunity for Latinos (Centro Sol), Johns Hopkins University. As part of this role, I educate the public via electronic, print, radio, and television regarding issues important to the care of older Latinos.
2015 – present	Faculty Advisory Committee member, Johns Hopkins annual conference on women's health called *A Woman's Journey*. As part of this role, I help define compelling women's health issues based on emerging research, identify potential speakers, mentor first-time faculty participants, and foster relationships with internal and external organizations, committees and individuals interested in women's health.

See also activities under section entitled, "Dissemination to lay audiences."

Humanitarian Activities None

Philanthropic Activities None

International Clinical Experience

1998	U.S. Indian Health Service, Fort Yuma Indian Hospital, Yuma, Arizona
2002	Cuba, Escuela de Salúd Pública, La Habana
2003	Brazil, Faculdade de Medicina, Universidade de São Paulo, Ribeirão Preto
2007	Tanzania, Wellesley College Alumnae Association
2008	Peru, University of Chicago Alumni Association

2009	Dominican Republic, Universidad de la Tercera Edad
2011	México, Hospital Civil de Guadalajara
2011	Colombia, Fundación Santa Fe de Bogotá
2013	Canada, University of Calgary
2013	Japan, Asahi General Hospital

Other

1992 – 1994	Teaching Assistant, Department of Sociology, University of Kansas, Lawrence, KS
1993 – 1994	Research Assistant, Department of Chemistry, University of Kansas, Lawrence, KS
1994 – 1995	Research Fellow, CDC Work Group on Health Promotion and Community Development, Kansas Health Foundation, Lawrence, KS
1995 – 1997	Ambulatory Care Clinician**,** Project HOPE, New Haven, CT
1996 – 2000	Medical Interpreter, Yale-New Haven Hospital, New Haven, CT
1998 – 1999	Research Analyst, Harvard University Health Services, Cambridge, MA
2004 – 2006	Quality Improvement Analyst, Johns Hopkins Home Care Group, Baltimore, MD